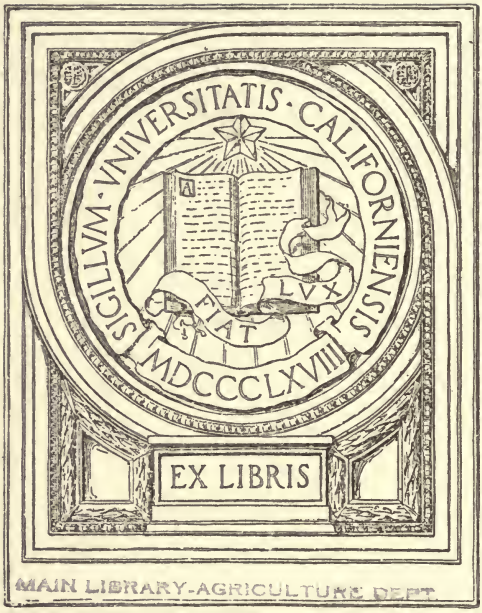
THE WORLD'S MEAT FUTURE

A. W. PEARSE, F. R. G. S.



MAIN LIBRARY-AGRICULTURE DEPT.

PRESS NOTICES OF THE FIRST EDITION

Melbourne Leader.—The author of "The World's Meat Future" can claim first-hand knowledge of his subject. He represented Australian and New Zealand Meat Works at the International Congresses of Refrigeration in Paris and Chicago in 1908 and 1913 respectively, also the Federal Government at the latter Congress.

Brisbane Daily Mail.—During the progress of the war leading men in the Empire expressed anxiety in regard to the meat supply, and were of opinion that after the war there would be a scarcity of meat. Statements of such vital importance to the Empire must impress everyone, and they are dealt with in a comprehensive manner in "The World's Meat Future." Mr. Pearse is well able to deal with such a great subject, and his book is one that will easily be recognised as an authoritative volume all over the world.

The Mercury (Adelaide).—"The World's Meat Future" is of considerable interest to persons either directly or indirectly engaged in the pastoral industry. The author has a sound knowledge of the subject.

Evening Herald (Melbourne).—Knowledge and the capability to impart it in an interesting and instructive way belong to the author of "The World's Meat Future." The book contains a great deal of very valuable information not only to stock-owners but to the general public. The publication comes at a very opportune time, when everybody is more or less interested in the meat supply.

Evening News (Sydney).—"The World's Meat Future" is an able and conscientious effort to condense the necessary knowledge of the exact place and prospects of meat in the world into nearly 300 carefully wrought pages. The author's qualifications for the task are, of course, well known. It is impossible in a review to condense more than a fraction of the wealth of fact and carefully weighed opinion in the book, which will repay the close study of everyone who desires to be well grounded in the meat question.

The Age (Melbourne).—"The World's Meat Future" gives an exhaustive account of the live stock position and meat prospects of all the leading stock countries of the world.

The Australian Meat Trade Journal (Sydney).—The author of "The World's Meat Future" is particularly well qualified to deal with his subject, for he has been closely associated with the development of the meat industry, especially in connection with refrigeration and cold storage, for the past twenty-five years.

Sydney Morning Herald.—Almost everyone wants to know what is going to be the position of our meat supply and the export outlook now that the war is over. In view of the importance of the trade, a timely contribution to the subject comes to us in form of an excellent publication—"The World's Meat Future."

The Register (Adelaide).—A volume which will be read with deep interest and appreciation is "The World's Meat Future." The letterpress throughout is liberally illustrated with photographic reproductions and diagrams.

Sydney Stock and Station Journal.—Mr. A. W. Pearse, F.R.G.S., editor of that unrivalled publication, *The Pastoral Review*, has just published a book on "The World's Meat Future," and it is timely, authoritative, comprehensive, educational, up-to-date, and full of interest. It deserves the widest circulation, and we would recommend it to stock-owners everywhere; also we would like to see every politician in Australia read, mark, and inwardly digest this book. It is just as useful in one country as another.

THE WORLD'S MEAT FUTURE

LIBRARY OF
CONGRESS

Bullocks Watering on the Lachlan, N.S.W.

THE WORLD'S MEAT FUTURE

AN ACCOUNT OF THE LIVE STOCK POSITION AND MEAT PROSPECTS OF ALL LEADING STOCK COUNTRIES OF THE WORLD WITH FULL LISTS OF FREEZING WORKS

BY

A. W. PEARSE, F.R.G.S.

EDITOR OF "THE PASTORAL REVIEW"

MELBOURNE, SYDNEY, ADELAIDE, BRISBANE, PERTH, LAUNCESTON

WITH AN INTRODUCTION BY

SIR OWEN COX, K.B.E.

COMMONWEALTH MEAT ADVISER

SECOND EDITION

NEW YORK

E. P. DUTTON & COMPANY

PUBLISHERS

UNIV. OF CALIFORNIA

SF41
P4

MAIN LIBRARY-AGRICULTURE DEPT.

Printed in Great Britain

N. W.

INTRODUCTION

One of the most important questions at the present time, when the peace negotiations are settled, is that which forms the subject matter of this book. Everybody wants to know what is going to be the position of the meat supply, and all sorts of prognostications are being given expression to. No one should have a better idea of the possibilities of stock raising in various countries than Mr. A. W. Pearse. For twenty-seven years he has been closely identified with the meat industry, not only in Australia, but in most of the stock-raising countries of the world. The newspaper of which he is the editor and proprietor (*The Pastoral Review*) circulates in all stock countries, and I don't suppose there are many men interested in the meat trade who do not eagerly look for and read the information he supplies. His paper alone has well-paid representatives and experts in most countries where stock are reared, and direct and authentic information and tables of exports are regularly forwarded by them. So satisfied are the meat firms of Australia and New Zealand with his capability and knowledge that on two occasions he has been the representative of all the meat-exporting companies of Australia and New Zealand at International Congresses, the first in Paris in 1908, and the second in Chicago in 1913. At the last conference he also represented the Federal Government of Australia, and read a paper on the world's meat export trade before a vast gathering of experts from all over the world. Most of his knowledge has been gained first hand. He has visited the States of South America and Africa several times, and when the war broke out was booked for a trip through Siberia to gather information and prospects there. There may be readers who will not agree with all his conclusions, but I have no doubt the information he gives will add largely to our

493938

knowledge of what we can expect in the way of meat supplies in the near future. *The Pastoral Review*, of which he is editor, is certainly looked upon by those concerned in the trade as the standard paper and "enquire within" for all matters connected with live stock and meat exports in all parts of the world.

E. Owen Cox, K.B.E.

Commonwealth Meat Administrator. Deputy Controller of Overseas Shipping. Member of the Commonwealth Government Shipping Board. Chairman of The Overseas Central Committee, which has the disposition of the whole of the tonnage loading oversea from Australia and British Government tonnage. Director in Australia of the Federal Steam Navigation Co., Ltd., and Chairman of the Australian Frozen Meat Shipping Committee for the Imperial Government.

Sydney, Nov. 6, 1918.

FOREWORD

In venturing to publish this book, the author does so in the hope that it may be of service to those interested in the food problems which are before us. It should also be of use to those stock-owners all over the world who are anxious about the future of the stock-raising industry.

For several years prior to the war it was a widely held theory that the world's meat consumption was overtaking the supply. Not so much to combat this belief as to furnish the industries concerned with the fullest facts governing the future as well as the present position, I have published from time to time in *The Pastoral Review* particulars of progress and development of meat production in the later fields of enterprise as well as in the domains of more mature exploitation of this resource of Nature. The assembling of this and much other information within the covers of the present volume is, I think, the first attempt to treat the subject at all comprehensively.

It will be seen that I am not pessimistic as regards the meat supply of the future, and I hold that for many years cattle and sheep raising are going to be the most profitable of all industries. There are no better prospects for young men than in the healthiest and cleanest of all professions—that of stock raising—provided that before they launch out on their venture they obtain the necessary practical knowledge and experience. Wool and meat will always be in strong demand, and there is no sign that either will be in over supply for many years. Governments must assist and not handicap the stock-breeders, and minimum prices, not *maximum*, should be the rule if prices have to be fixed at all. The cities are entirely dependent upon the producer. "Destroy your country, and the grass will grow in the streets of your cities, but make the country prosperous and the cities will jump ahead in prosperity."

In describing area, climate, and pastoral conditions of some of the Central American Republics not visited by me during recent years, I have had recourse to those splendid books, *The Great States of South America*, by C. W. Domville-Fife; *Brazil and the Brazilians*, by G. J. Bruce; *Brazil in* 1913, by J. C. Oakenfall; *Argentine and Uruguay*, by Gordon Ross; and *Central America*, by W. H. Koebel.

A. W. P.

June 30th, 1919

CONTENTS

	PAGE
Introduction by Sir E. Owen Cox, K.B.E., Australian Meat Administrator	ix
Foreword	xi
The World's Meat Future	1
Summary of Meat Supplies	17
Trade and Empire	21
Australia	27
,, Causes of Shortage in Live Stock and Suggested Remedies	32
,, Diagrams of Meat Exports	38
,, Climatic Control of Production	40
,, Reconstruction and Expansion	43
,, Diagram Illustrating the Above	53
,, The Indian Zebu for Australia	55
,, Fixing Prices	59
,, Cattle Prospects in Western Australia	61
New Zealand	65
,, The Frozen Meat Trade	66
Argentina	83
,, Shorthorns	96
,, Tierra del Fuego and Southern Patagonia	97
,, The Argentine Mesopotamia	110
,, The Back Country	118
,, The Plate Coast Belt	124
,, Refrigerator Motor Trucks	129
,, Argentine Meat Consumption and Export	130
,, Frigorificos and Meat Factories	131
,, Exportation	132
,, Home Consumption	132
,, Cattle Weights—Live and Dead	133
Brazil	134
,, Brazil as a Pastoral Country	143
Uruguay	150
Paraguay	152
Chile	155
Patagonia	156
United States	159
,, Centralized Live-Stock Marketing	162
,, Improving Power of the Shorthorn	166

PAGE

United States: Breeds of Beef Cattle 171
„ The Hereford, Polled Herefords, Aberdeen-Angus, The Galloway, Dual-Purpose Breeds, Shorthorns, Red Polls, Devons, Brahman Cattle 176
Canada 189
„ Quality and Weight of Cattle 190
„ Score Card for Beef Steer 194
„ Making Baby Beef in Alberta 195
„ Points of Beef Cattle 200
Mexico 202
Venezuela 207
British Guiana 211
Ecuador 213
Colombia 214
Honduras 217
Bolivia 220
Peru 221
Rhodesia 223
„ Building up the Herds 232
„ Coming Beef Exports 232
South Africa 240
„ Sheep Breeding 250
Madagascar 255
„ Mutton Exports 262
Morocco 263
„ Live Stock 264
„ Land 265
British East Africa 266
South-West Africa 278
Egypt and the Soudan 279
Sheep in Egypt and Southern Palestine 282
Nigeria 290
Abyssinia, Somaliland and the Cameroons 292
China 293
Siberia 295
The Pacific Islands, (Fiji, New Caledonia, Sandwich Group) . 297
Japan 301
Innovation in Mutton Stowage 302
Dipping Cattle 304
Cattle Tick Eradication 307
Dehorning Cattle 313
Live and Dressed Weights 315
Venison 317
Statistical Study of Body Weights, Gains and Measurements of Steers During the Fattening Period, with Tables . . 318
List of Meat Canning and Preserving Works in Australia, New Zealand, Argentina, Patagonia, Uruguay, Paraguay, Brazil, Venezuela 326

ILLUSTRATIONS

Bullocks Watering on the Lachlan		*Frontispiece*
		PAGE
Champion Hereford Helfer		16
Shorthorn Cow and Bull Calf		22
Champion Hereford Bull		24
Australia : Cattle at a Dam (Victoria)		26
,, Stud Shorthorn Cow (New South Wales)		28
,, Champion Shorthorn Bull		29
,, Aberdeen Angus Cow (Queensland)		31
,, Shorthorn Bull (Sydney)		33
,, One of the Paddocks (Western Australia)		41
,, Aberdeen Angus Bull (Champion)		43
,, Hereford Bull		44
,, Champion Cow of Australia		45
,, Shorthorn Cow (Champion)		47
,, Fat Bullocks (Queensland)		49
,, Shorthorn Bull (Queensland)		51
,, Stud Shorthorn Bull (New South Wales)		52
,, Shorthorn Bull (Champion)		54
,, Hereford Bull ,,		55
,, Hereford Cow ,,		56
,, The Zebu—Shorthorn Cross		58
New Zealand : A Maori War Worker		66
,, Pastoral Scene		67
,, Stud Romney Sheep		69
,, Fat Bullocks		70
,, Wool Shed and Flock of Sheep		71
,, Stud Romney Sheep		73
,, Hereford Cattle		75
,, Whakatane Meat Works		77
,, Meat Works at Kaiapoi		78
,, Stud Romney Sheep		79
Argentina : Durham Cattle at Curumalan		85
,, An Estancia Homestead		87
,, Breeding Mares " El Socorro "		89
,, " Freezer " Store Cattle		91
,, Shorthorn Bull (Champion)		92
,, Shorthorn Cow ,,		93
,, Hereford Bull ,,		95
,, Hereford Cow		97

PAGE

Argentina : Fat Shorthorn Bullock 99
Patagonia : Group of Sheep 101
Argentina : Cattle Dip 103
,, Shorthorn Cow 133
Brazil : Typical Cattle—Shorthorn Cross 135
United States : Shorthorn Bull (Champion) 160
,, Shorthorn Cow ,, ... 163
,, Hereford Bull ,, ... 169
,, Shorthorn Bull ,, ... 173
Canada : Range Cattle 191
,, Shorthorn Cows 193
,, Shorthorn Bull 195
,, Mob of Cattle at Indian Head 197
,, Points of Beef Cattle 200
Honduras : Shorthorn Half-Blood Bull 218
South Africa : A Typical Karroo Scene 241
,, Cattle Crossing a River (Natal) 245
,, Zebu Heifer 247
,, Merino Rams 248
Madagascar : Soissonnais and Rambouillet Rams 255
,, Native Bull 257
East Africa : A Congoni 267
,, The Naivasha Stud Farm Manager 273
Egypt : Young Cows (Improved) 279
,, Native Bull 280
,, Native Bull, Improved (2226 lbs.) 281
Solomon Islands : Zebu Bull 297
Pacific Islands : One of the Paddocks on an Estate 299
Mutton Carcases : New Mode of Cutting for Export 302
Tick-Infested Ox Skin 308

England : The King's Shorthorns at Windsor 149
,, Lord Rothschild's Red Polls at Tring 188
,, Lord Rothschild's Hampshire Down Sheep 216
,, Lord Rothschild's Hampshire Down Ewes 219
,, Group of Heifers and Cows 222
,, Mr. J. E. Quested's (Kent) Dairy Cattle 277
,, The King's Herefords 291

THE WORLD'S MEAT FUTURE

Lord Harcourt recently said in the House of Lords that while he was acting as President of the Board of Trade, in 1916, he acquired information which caused him the greatest anxiety in regard to the meat supply, and added, "After the war there will be a scarcity of meat—almost a war famine. Germany, Belgium, and Holland are faced with a post-war deficit of 8,000,000 head of cattle, and Denmark, Austria, Servia and Roumania another 8,000,000. Europe, therefore, will seek to import from 16 million to 20 million head of cattle. Britain produces only 60 per cent of the meat consumed. I am so impressed with the seriousness of the position last year that I have sought to arrange a scheme for securing a supply of chilled meat, which will be ample for Britain for several years after the war."

This statement, by a prominent British statesman, is of such vital importance to the Empire that to the best of my ability I am going to place before those who care to read it, the position to-day in the various stock-raising countries of the world.

At the outset, I may say that I fear the information given to Lord Harcourt must have been of a hasty character. Granted that the shortage in the seven European countries named would amount to 16,000,000 head of cattle, that does not mean that a similar number or more would have to be imported to make up the shortage. First of all there will be probably 16,000,000 to 20,000,000 adults less to eat meat, and the children, or those of them left alive, will not by any means require so much meat for a few years after the war. Probably countries like Denmark, Holland, Germany and Austria will have kept a large proportion of breeding stock, and in three or four years a very large increase of young cattle may be looked for, particularly if they buy bulls from Britain, United

States, or Canada, where there is plenty of young male stock available. Meantime people will have learned economy, the use of horse and whale flesh, and the larger use of fish and cereals, besides which there is not the necessity they imagined for so big a meat diet.

As regards Great Britain's meat supply, the war has in no way diminished her flocks and herds ; in fact, if anything, they are larger than before the war. The total cattle at the end of 1916 being 12,451,450, and the sheep 28,849,655. Imagine in little Britain 2,000,000 more cattle than in all Australia. This is the more wonderful when we realise that over 2,500,000 acres of grazing lands have been put under crop. The British people have also learned the much needed lesson of economy, and after the war there will not be the enormous waste there has been in the past. Cold meat will not again be thrown away wholesale to the pigs and the dogs, it will be utilised as it should be. Again, many foods have taken the place of meat, and the people have discovered that they are much healthier on a smaller meat diet. Taking the population of Greater London, which represents roughly the area supplied from Smithfield, at 7,500,000, it can be seen that the Capital is now apparently consuming much less meat than before the war, the quantity marketed during 1917 being only 1.62 lbs. per head per week, i.e. including bacon, poultry, game, etc., as against 2.48 lbs. per head in 1913. The Empire's armies will get back to Australia, New Zealand, Canada, and India, where there is more than ample meat for all their wants, and it will be found that instead of 37 per cent of meat having to be imported, which before the war was Britain's requirements from abroad, probably 20 per cent or 25 per cent only will be needed. Sixty-three per cent of the total meat supply of Great Britain before the war was home grown. Of the imported meat supply (37 per cent), Argentina supplied 80 per cent of the beef, and Australia 12 per cent, the balance coming from various sources. New Zealand supplied 40 per cent, Australia 25 per cent, and Argentina 29 per cent of the imported mutton and lamb.

The flocks and herds in France have not decreased since 1916, in fact they have increased, but from the commencement of the war until that year the sheep flocks fell away by 30 per cent.

With the introduction of studs from Britain, however, they will rapidly gain in number and in weight. In July, 1917, their Census Returns accounted for 12,443,304 cattle,10,586,594 sheep, and 4,200,280 pigs. Supplies of home-grown meat for the civil population were accordingly fairly plentiful.

It must not be forgotten that there are several countries in Europe with enormous populations which make grain of various sorts their main food supply; therefore, in investigating the requirements for meat, it is well to remember this important factor, and those countries can be put on one side, as their main food supply will come out of the ground. Again, there are many nations whose people are meat eaters yet are not so fastidious as we are and use horse flesh, whale flesh, and other meats which the average Britisher or American refuses to touch.

The world's export output of frozen and chilled beef, mutton and lamb in 1917 was estimated at 965,000 tons, as against 915,380 tons in 1916, 881,075 tons in 1915, and 800,375 tons in 1914—a steady rate of expansion which was very satisfactory, under war conditions. From these yearly totals, about 386,000 tons, 381,569 tons, 218,150 tons, and 105,948 tons respectively were diverted to markets other than the United Kingdom.

The nations which are mainly beef, mutton, and pork eaters are the British Empire, United States, Germany, France, and a few other smaller countries in Europe; also most of the South American Republics. These are the countries whose supply and demand must be looked at when investigating the condition and prospects of the meat trade of the world, and I propose to take them in the order of their importance.

Many of the countries I shall describe have been visited by myself during the last thirty years with the particular object of studying their pastoral capabilities for the information of the graziers of Australia and New Zealand. Therefore this matter of stock and meat supplies comes in very opportunely. Russian requirements may be left out of the question. When these people settle down, introduce law and discipline, and have shot the men who have brought the country to its present pitiable condition, they will be able to draw what meat they will temporarily require from the vast plains of Siberia, Manchuria,

and China, where there are great herds of cattle available. Hard times for a year or two will be the fate of several of the Balkan States, but grain and potatoes are their principal foods, as I have stated before. It is gratifying to see that Sir Henry Rew, the well-known food statistician, agrees with my view. In a recent address before the Royal Statistical Society, he said : "It appears that during the war a very substantial stimulus has been given to overseas trade in meat, and that sources of supply hitherto almost untapped have been developed. It is clear that what may be termed the old reservoirs from whence meat supplies have been drawn are expanding and are capable of further expansion. There are also new and vigorous competitors for the world's trade."

Refrigerated tonnage after Peace is signed will be more than ample for all requirements, notwithstanding the submarines. Great Britain had more refrigerated tonnage at the end of last year than she had at the beginning of the war, and it must also be remembered that Italy, France, the United States, and other countries are building up quite a big fleet of refrigerated steamers.

THE FOLLOWING IS A LIST OF THE CHIEF STOCK-PRODUCING COUNTRIES OF THE WORLD :—

Australia.
New Zealand.
Argentina.
Brazil.
Uruguay.
United States.
Canada.
Paraguay.
Mexico.
Cuba.
Nicaragua.
Venezuela.
Colombia.
Honduras.
Chile.
Guatemala.
Peru.
Rhodesia.
British East Africa.
Union of South Africa.
Bechuanaland.
S.W. Africa.
Nigeria.
Morocco.
Madagascar.
Egypt.
Soudan.
Abyssinia.
Somaliland.
Cameroons.
Algeria.
Manchuria.

All the above-mentioned countries possess a more or less large supply of sheep and cattle of more or less satisfactory quality. Most of them have vast areas of fine grazing land, many with excellent climate and with plenty of rivers. With one or two exceptions they are countries fit for the white men to live and thrive in ; many of them are sparsely populated, and land is to be obtained at moderate cost.

With the introduction of good stud animals to those countries which are yet in their undeveloped condition, the installation of numerous dips, and with stable governments, in a very few years they could most of them be brought to the meat-exporting stage. The past experience in Argentina and Uruguay, and the present experience in Brazil, are sufficient to show the more backward countries what they may look forward to under modern business methods. The great need in most new countries is for animals that will improve the native stocks so that they may increase in weight, shape and quality. That such animals are procurable, and even in large numbers, in Great Britain, the United States, Australia, New Zealand and Argentina, is quite evident if one visits the magnificent stock shows in those countries. Cattle and sheep are available of high-class quality, of all breeds, and to suit all climates and pastures, and directly the world settles down after this war-madness is quenched, it is highly probable that men will be touring those countries and buying largely to improve their backward flocks and herds. The stud breeder is doing an international work, and should be encouraged by the Governments of the countries in which he is carrying on his good work.

The Latin-American Division of the U.S. Bureau of Foreign and Domestic Commerce lately prepared a report on the meat-packing industry in South America, with the view of showing that that continent, with its increasing areas suitable for cattle raising and its meat-packing establishments, is in a position to play an important part in the world's meat production in the future. This report says that one of the most serious questions confronting the countries of the world is that of the meat supply of the future. For nearly a decade the number of cattle has not been increasing in proportion to the demands of the growing populations. The decrease in the supply of

meat has affected the United States as well as Europe. Russia, which before the war had some 50,000,000 head of cattle and two-thirds as many sheep as Australia, has ceased, temporarily at least, to be a factor in the European trade. The herds of western Europe, small before the war in comparison with the demands of the increasing population, are now greatly depleted and cannot be replaced for many years after the war. The situation in the United States is reaching an interesting stage. Within the last ten years the population has increased about 18 per cent, while the herds have decreased 20 per cent. In 1893 the United States imported 3293 head of cattle, and from its abundant supply exported over 287,000. In 1915, twenty-three years later, the import and export figures are practically reversed. In the latter year the United States exported only 5484 head and imported 538,167 cattle. However, since this report was issued, the export of meat has again assumed enormous proportions through the increase of stock and the magnificent economy of the American people.

The report goes on to ask whether South America, with its extensive areas suitable for cattle raising, and its growing meat-packing plants, will help to relieve the situation? The outlook in that direction is, indeed, favourable. Already Argentina and Uruguay, and in a lesser degree Brazil, Colombia, and some of the other countries, are figuring as meat-producing possibilities. In the development of this industry, the general installation of refrigeration by steamship lines has been of great service.

In South America stock breeding is a resultant industry of meat freezing. Before the introduction of refrigeration, salted and dried meat, tough and unpalatable, was in general use locally and exported in limited quantities to Europe. This meat is known variously as jerked beef, in Argentina as tasajo, as xarque in Brazil, in Peru as charque, and as biltong in Africa. It is still used in some parts of South America and in the Tropics, where it is almost impossible to keep fresh meat, but it has never been popular in Europe. As the saladeros (meat-drying establishments) could make use of almost any animal, and since the demand was quite limited, there was really no incentive to breed fine stock.

Stimulated by the increasing demand from Europe for im-

ported fresh meat, attempts were made to export cattle on the hoof. These, however, proved unsuccessful owing to the outbreak of foot-and-mouth disease and the extra expense entailed. Then the meat-packing and, indirectly, the stock-raising industries were revolutionised by the introduction of refrigeration. This made possible the shipping of frozen and chilled meat. Chilled meat has a much more delicate flavour than the solidly frozen meat, and normally brings $1\frac{1}{2}$ to $2\frac{1}{2}$ pence a pound more on the English market, but it must be used immediately after removing from cold storage.

Argentina is to-day the most important beef-producing country of the world. Brazil is beginning to appreciate its own potentialities as a meat producer, and is likely to become a powerful rival in the near future. Uruguay has maintained a leading position, while Paraguay, Colombia, and Venezuela are among the countries that are receiving careful consideration from far-sighted American and English packers.

The meat-packing industry of Argentina has been spared the hardships incidental to the experimental stages of a new undertaking. Its market was already created ; finely bred cattle were available in Europe and the United States ; it had but to model its packing houses along well-established lines. It was not until 1901, when the exports from the United States began to decline materially, that exports of Argentine beef began to assume importance ; but since then the increase has been steady and rapid. Australia and New Zealand, with a well-established trade in frozen mutton, largely supplied the markets for this product. In the beginning Argentina paid but little attention to the raising of hogs, so that the export of pork was of relatively little importance. During the period of 1908 to 1914 a decided change took place. The number of hogs in Argentina in 1914 represented an increase of 1,496,994 over the number in 1908, while cattle and sheep showed a corresponding decrease. This would seem to indicate that special attention is being paid to the pork-packing branch of the industry. Another indication of the future tendency is the fact that the Armour company in Buenos Aires has equipped its new plant with facilities for handling 1000 hogs, in addition to the 1500 cattle and 2500 sheep, per day.

England has been the principal market for Argentine beef, which it admitted free of duty, while many of the other European countries imposed prohibitive import duties. This condition is changing, due partly to the war demands; Italy and France are importing large quantities of frozen beef for their armies, and the United States has opened its markets to foreign meat.

With regard to the current situation, Messrs. W. Weddel and Co., in their annual report of 1917, give interesting particulars, which are worth quoting *in extenso* :—

"The world's export output of frozen and chilled beef, mutton and lamb in 1917 is estimated at 965,000 tons, as against 915,380 tons in 1916, 881,075 tons in 1915, and 800,375 tons in 1914—a steady rate of expansion which must be considered very satisfactory under war conditions.

"That this great industry has been maintained on so large a scale throughout the whole period covered by the war speaks well for the energy of suppliers, the efficiency of the British Navy, the pluck of the Mercantile Marine, and the enterprise of the Allied Governments, for whom the handling of the great bulk of these exports is now organised.

"The official weights of the various descriptions of frozen and chilled meat imported into the United Kingdom in 1917, as well as the number of packages, are not available, but those for the previous four years, along with the approximate total import in 1917, were as follows :—

	1913	1914	1915
Australia	150,666 tons	143,853 tons	124,572 tons
New Zealand	122,234 ,,	142,700 ,,	157,901 ,,
Argentine Refublic	409,211 ,,	356,936 ,,	293,909 ,,
Other Countries	38,146 ,,	50,938 ,,	86,543 ,,
Total	720,257 tons	694,427 tons	662,925 tons

	1916	1917
Australia	51,343 tons	
New Zealand	158,123 ,,	
Argentine Republic	240,297 ,,	
Other Countries	84,048 ,,	
Total	533,811 tons	About 550,000 tons

Argentina has been shipping very heavily also to the United States during the past two years.

The Continent of Europe

"Last year, frozen meat business on the Continent was again of a special character, inasmuch as deliveries, practically without exception, were made under Government Contracts for Army supplies.

"*France.*—Arrivals of frozen meat were regularly maintained at French ports throughout the year, so that the aggregate quantity imported was fully as important as during the preceding year. Precise figures, however, are not available. The whole import was utilised for feeding the Allied Armies, with the exception of relatively insignificant quantities which the Government at times allowed to be delivered to co-operative societies and municipal shops for civil consumption in Paris.

"Partly as a result of the steady importation of frozen meat, there was no further depletion of the French herds. On the contrary, these are believed to have recovered lost ground during the past year, and in July last the Census Returns accounted for 12,443,304 cattle, 10,586,594 sheep, and 4,200,280 pigs—totals which compare favourably with the figures for 1916. Supplies of home-grown meat for the civil population were accordingly fairly plentiful, and there was no question of any serious shortage such as has been experienced in the United Kingdom. In fact, during the autumn, the Army authorities availed themselves to a certain extent of the extra supplies that were being marketed to create a temporary reserve of frozen meat, so far as the cold storage accommodation would allow. Two meatless days per week were instituted from March until September inclusive, after which period it was found possible to discontinue this restriction.

"*Italy.*—During 1917 the quantity imported was greater than in any preceding year; but the still increasing demand exceeded the supply, and it may be assumed that Italian herds of cattle decreased during the year, in spite of the fact that the two meatless days per week, instituted in May, 1915, are still enforced.

"The fleet of Italian-owned refrigerated steamers is now of some importance, and these vessels are proving of great utility

in the importation of the increased supplies required by the Allied Armies now operating in Italy.

Notes on Various Sources of Supply

"*United Kingdom.*—On paper, the herds and flocks of this country were in a satisfactory position when the usual annual census was taken on 4th June, 1917, by the Board of Agriculture. The number of cattle at that date was 12,381,186 head, compared with 12,451,540 head in June, 1916, a reduction of only 0·5 per cent from the largest total on record. In the case of sheep the figures were 27,867,244 in 1917, against 28,849,655 in 1916—a reduction of 3·4 per cent from one of the best years of the present century.

"*Australia.*—Weather conditions continued to be highly favourable in all parts of the Commonwealth, and stock generally are in good fettle. Nevertheless, exports of beef were considerably lighter than was anticipated, disastrous droughts two years previously having materially reduced the herds in Queensland. Mutton was shipped in restricted volume because so many graziers, anxious to replenish their flocks, were ready to pay prices for stock beyond the moderate limits imposed upon the freezing works by their contract with the British Government. The works, however, have taken these operations philosophically, realising that they mean larger supplies of freezers for them in the near future.

"The total export output of beef, mutton and lamb in 1917 from all the Australian works was 118,540 tons, of which 108,740 tons were beef, and only 9800 tons mutton and lamb. This meat was all shipped for the United Kingdom, except 5530 tons. In 1916 the total export was 104,000 tons ; in 1915, 132,090 tons ; and in 1914, 171,200 tons.

"Storage accommodation had been much increased during 1916 in expectation of a larger export trade, but this extra space was not required in 1917, partly because of the restricted quantities handled, and partly because the supply of tonnage was comparatively well maintained. Several experiments were made in the cutting of frozen carcases, with a view to economical stowage on board ship ; and in the case of mutton and lamb

these proved successful to the extent of saving 15 to 30 per cent of space. Very much more freight space might have been saved by shipping a larger proportion of boned beef.

"*New Zealand.*—The export trade was carried on throughout the year under the revised contract made with the Imperial Government in October, 1916. Owing to scarcity of tonnage, shipments were considerably smaller in 1917 than in 1916. Fortunately large additions had been made to the storing capacity of all the leading works in the Dominion, so that there was no real difficulty about holding over stocks in store. Towards the end of the year the large shipments made relieved the position; but the restriction of business throughout the year added considerably to the cost of production.

"Sales of the surplus supplies of lamb were made in London at 9½d. in January and at 10d. during the remainder of the year, but the total quantity distributed through the usual trade channels was quite inadequate, the market being continuously understocked.

"The report of the Commission appointed to inquire into the operations of American packers in New Zealand was issued in October. It practically amounted to an indictment of their methods generally, and contained a strong warning against their being permitted by the Government to acquire any further hold on the trade of the Dominion.

"*Canada.*—A further satisfactory development of the export trade from the Dominion took place last year, when shipments to the United Kingdom and France amounted to 55,000 tons, as compared with 15,200 tons in 1916, and 6280 tons in 1915. A certain proportion of the 1917 total consisted of United States beef railed to Canadian ports for shipment; nevertheless, the purely Canadian trade shows signs of healthy expansion, with many indications of its becoming a well-established industry after the present abnormal conditions have disappeared. The latest live-stock statistics, published in September last, support the view that the Canadian farmers are making strenuous efforts to augment their meat supplies, the number of cattle in 1917 being estimated at 7,920,940 head, as against 6,594,151 head in 1916—a remarkable increase of 20 per cent. Sheep also increased from 2,022,941 head in 1916

to 2,369,358 head in 1917; but there is still no export of mutton from Canada.

"*South Africa.*—As a promising new source of Empire meat supply, the Union of South Africa continues to gain in importance. The pastoral conditions of the country are eminently suitable for beef production on a large scale, the existing herds of cattle totalling about 8,000,000 head. Farmers throughout the Union are increasing their efforts to provide beef of a quality suitable for export; freezing accommodation is being extended as rapidly as war conditions will allow; railway facilities are being improved; and the British Government, by providing freight space and purchasing full cargoes at fair prices for Army requirements, is lending valuable aid to the new industry.

"Exports last year amounted to 22,400 tons, as compared with 7928 tons in 1916, and 2324 tons in 1915. Of the 1917 total only about 3200 tons came to England, the balance being shipped to other destinations. The restricted quantities which reached the London market from time to time showed no real improvement in quality or condition, as compared with arrivals in 1916. In these respects good results are hoped for from the Commission which the Union Government is reported to be sending to Australia and New Zealand for the purpose of studying the methods of meat production and preparation followed in those countries. It should be realised by shippers that although high prices were secured in this market for the small consignments which came to hand, beef of the quality recently shipped from South Africa would not be very acceptable here under normal conditions.

"*South America.*—The total export of frozen and chilled meat from the various South American Republics in 1917 amounted to 540,000 tons, as compared with 528,500 tons in 1916, and 471,250 tons in 1915. With the exception of the Argentine Republic, all the exporting countries increased their output.

"*Argentine Republic.*—The weather of 1917 was generally favourable for live-stock, especially in the Province of Buenos Aires, which produces 80/90 per cent of the beef exported; the animals improved greatly in condition, and were in plenti-

ful supply throughout. The results of the live-stock census taken in 1914 have only recently been published, and reveal a serious reduction as compared with the official 'estimates' issued from time to time. Cattle were returned at 25,866,763 head, and sheep at 43,225,452 head, as against 29,116,625 cattle, and 67,211,754 sheep at the previous census taken in 1908. These decreases are somewhat disconcerting, but fortunately the causes which provoked them, viz. the great droughts of 1911, 1912 and 1913 have disappeared; and the favourable seasons of the past few years appear to have effected a quick recovery in the number and quality of the live-stock of the country, particularly in the case of cattle. This view is borne out by an official census taken in the Province of Buenos Aires (the principal centre of the cattle-raising industry) in 1916, which recorded an increase in cattle of nearly 25 per cent, the figures being 11,336,513 head in 1916, as against 9,090,536 head in 1914. It is generally reckoned that the number of cattle in the Argentine Republic is now about 29,000,000 head, while sheep are estimated to number about 55,000,000 head.

"The operations of the freezing works were limited by the amount of refrigerated tonnage available, and in some cases the work was interfered with by strikes, with the result that the year's shipments of frozen and chilled meat, amounting to 377,430 tons, fell short of the previous year's total of 436,400 tons by 13·5 per cent. Four-fifths of the exports were sold to the Allied Governments for Army consumption, the remainder being reserved for the civilian trade in the United Kingdom.

"Pastoral prospects are now brighter than they have been for several years past; and, apart from any deficiency in refrigerated tonnage, a much increased export in 1918 should be assured. An export tax, which comes into operation as from 1st January, 1918, introduces a new element of uncertainty into the market; but the tax is likely to be borne by the seller and not by the ultimate buyer, so long as prices are controlled on this side of the world.

"*Uruguay.*—The number of cattle in 1916 was estimated at 7,802,000, as against 8,192,600 in 1908, while sheep declined from 26,286,000 to about 11,473,000 head. These decreases

are attributed to climatic conditions, the severe drought of 1915–16 causing many deaths. Some recovery was, however, effected last year as a result of the more favourable season.

" Shipments from the two freezing works at Monte Video amounted to 72,250 tons, as compared with 43,900 tons in 1916. With the important new freezing works erected by the Morris Beef Co. at Monte Video in operation, some further increase in exports is looked for in 1918.

" *Brazil.*—The export trade from Brazil has expanded in a remarkable manner, and that country bids fair soon to become one of the most important sources of meat supply. In 1915, the first year of trading, the exports were 8000 tons ; in the following year they increased to 33,130 tons ; while last year 66,450 tons of beef were shipped—chiefly to the Continent, for the Italian and French Armies. The beef is small and very suitable for these countries, though it would hardly be big enough for the best trade in this market. There are now four freezing establishments in Brazil, with several others in course of construction or in contemplation ; and everything points to there being a further expansion in exports during the coming year. The number of cattle in Brazil is estimated at 30,000,000 head, the bulk of which, however, are still of somewhat poor quality.

" *Patagonia.*—The whole output of mutton and lamb from the Patagonian freezing works in 1917 was purchased by the British Government. The quality proved to be quite satisfactory. The mutton was reserved for Army use, but small quantities of lamb were released from time to time for sale to the public through the usual channels. Shipments during the year amounted to 18,700 tons, as compared with 11,986 tons in 1916, and 7863 tons in 1915.

" *United States.*—The latest returns published by the United States Bureau of Statistics in January, 1918, estimate the number of cattle at present in that country at 66,830,000 head, an increase of 3,100,000 (or 4·9 per cent) over the previous year's total of 63,700,000 head, and 18·2 per cent more than the low-water mark in 1913, when only 56,527,000 head were recorded. Sheep were returned at 48,900,000 head, as com-

pared with 48,500,000 at the end of 1916. The figures in respect of cattle indicate that steady progress is being made in replenishing the herds of the United States, which had suffered a steady and serious decline for several years prior to the war.

"Exports of refrigerated meat showed further expansion during the year, and amounted in aggregate to 95,430 tons, of which 56,000 tons were shipped to the United Kingdom, 22,350 tons to the Continent, and 17,080 tons railed to Canada (presumably for shipment to Europe) as compared with 80,940 tons in 1916, of which 41,820 tons came to the United Kingdom, and 39,120 tons went to the Continent. So recently as in 1913 the total export was only 437 tons.

"In view of the comparative proximity of the United States to this country, and its active participation in the war, an increased export of meat may be expected from that quarter during the coming year.

Prospects

"The opinion is held almost universally that after the war there will be a scramble amongst all the big consuming countries of the world and some of the smaller nations which have not previously been importers of meat, for a share in the world's exportable surplus. High prices are anticipated as a consequence of the keen competition to be looked for under such circumstances; and fears are freely expressed that the available supplies will fall far short of the requirements of a Continent which for some years has been reduced to very modest rations under the stress of war.

"The outlook for supplies is, however, more than hopeful; plenty is almost assured. The producing countries of the world in Australasia, South America, North America and also South Africa are being favoured with good seasons as a rule, they are all well supplied with refrigerating plant, and stock is nowhere scarce. The only problem remaining to be solved is transport, and even that is not by any means unsatisfactory. The tonnage of refrigerated steamers now in existence under the British flag is as large as at the outbreak of war; and new shipping lines have been started in France and Italy which bring the

world's aggregate of refrigerated tonnage into an exceptionally strong position. If only the available means of transport be utilised to their full capacity for this their main purpose, there can be little doubt but that the most pressing prospective demands will not go unsatisfied for want of the meat nor for lack of ships to bring it to Europe."

CHAMPION HEREFORD HEIFER, CLIVE IRIS 3RD, ENGLISH ROYAL SHOW. EXHIBITED BY MR. F. BIBBY

The following statistical tables are herewith produced from Messrs. Weddel and Co.'s Annual Review.

I.—Table showing the quantity of *Frozen Mutton and Lamb* (in carcases) *imported into the United Kingdom* since the trade commenced.

Year.	Australia.	New Zealand.	South America.	Other Countries.	Totals.
1880	400	—	—	—	400 C/cs.
1881	17,275	—	—	—	17,275 ,,
1882	57,256	8,839	—	—	66,095 ,,
1883	63,733	120,893	17,165	—	201,791 ,,
1884	111,745	412,349	108,823	—	632,917 ,,
1885	95,051	492,269	190,571	—	777,891 ,,
1886	66,960	655,888	434,699	30,000F	1,187,547 ,,
1887	88,811	766,417	641,866	45,552F	1,542,646 ,,
1888	112,214	939,231	924,003	—	1,975,448 ,,
1889	86,547	1,068,286	1,009,936	—	2,164,769 ,,
1890	207,984	1,533,393	1,196,531	10,168F	2,948,076 ,,
1891	334,684	1,894,105	1,111,137	18,897F	3,358,823 ,,
1892	504,738	1,539,605	1,247,861	17,818F	3,310,022 ,,
1893	636,917	1,857,598	1,373,723	16,425F	3,884,663 ,,
1894	939,360	1,958,259	1,414,815	11,675F	4,324,109 ,,
1895	1,005,503	2,412,331	1,615,795	19,438F	5,053,067 ,,
1896	1,643,243	2,211,895	1,792 280	—	5,647,418 ,
1897	1,407,417	2,703,845	2,121,471	—	6,232,733 ,,
1898	1,248,653	2,784,101	2,397,337	—	6,430,091 ,,
1899	1,204,601	3,250,100	2,414,718	—	6,869,419 ,,
1900	943,924	3,157,060	2,332,837	—	6,433,821 ,,
1901	1,226,558	3,234,119	2,634,105	—	7,094,782 ,,
1902	724,297	3,668,061	2,827,496	—US	7,219,854 ,,
1903	478,037	4,583,760	3,118,437	—NA	8,180,234 ,,
1904	450,323	3,885,231	2,937,701	—	7,273,255 ,,
1905	1,368,438	3,704,566	3,203,210	—	8,276,214 ,,
1906	1,732,328	4,148,288	2,919,276	—	8,799,892 ,,
1907	2,337,931	4,797,367	3,015,229	—	10,150,527 ,,
1908	1,831,246	4,234,158	3,586,014	—	9,651,418 ,,
1909	2,678,838	5,035,103	3,353,211	—NO	11,067,152 ,,
1910	4,219,808	5,407,474	3,353,762	—	12,981,044 ,,
1911	3,612,279	5,222,495	4,125,609	—	12,960,383 ,,
1912	2,883,479	5,495,291	3,630,395	—	12,009,165 ,,
1913	4,442,517	5,673,624	2,820,024	—	12,936,165 ,,
1914	3,722,830	6,181,184	2,884,825	—	12,788,839 ,,
1915	3,582,911	6,494,197	2,111,596	2,657	12,191,361 ,,
1916	671,888	5,407,222	2,311,451	82,175	8,472,736 ,,
1917	1,196,140	2,873,878	1,748,750	19,227	5,837,995 ,,
1918	38,578	2,830,712	1,601,107	459	4,470,856 ,,
Totals	47.975,442	112,643,194	74,527,766	274,491	235,420,893 ,,

F—*Falkland Islands.* US—*United States additional* 49,924 (*chilled*).
NA—*North America additional* 53,577 (*chilled*). N—*Natal additional* 189.
O—*Orange River Colony additional* 40.

II.—Table showing *numbers* of Cattle and Sheep in the United Kingdom in each of the past six years, and *importations* of Live Stock, Beef, Mutton and Lamb from all sources during 1913–18 :—

				1918	1917	1916	1915	1914	1913
HOME SUPPLY	CATTLE	Cows and Heifers ..	No.	4,603,841	4,514,803	4,499,321	4,494,750	4,595,128	4,317,957
		Other Cattle	,,	7,707,308	7,867,433	7,952,219	7,676,702	7,589,377	7,618,643
		Total ..	No.	12,311,149	12,382,236	12,451,540	12,171,452	12,184,505	11,936,600
	SHEEP	Breeding Ewes ..	No.	10,985,361	11,444,673	11,603,904	11,341,904	11,255,727	11,057,425
		Other Sheep ..	,,	16,077,320	16,422,571	17,245,751	16,934,066	16,708,250	16,571,781
		Total ..	No.	27,062,681	27,867,244	28,849,655	28,275,970	27,963,977	27,629,206
It is estimated that 25% of the Cattle and 40% of the Sheep are available for slaughter annually.									
FOREIGN LIVE STOCK	CATTLE	United States ..	No.	—	—	—	—	—	10,093
		Canada	,,	—	—	—	—	—	1,755
		Other Countries ..	,,	—	—	—	—	2,234	2,895
		Total	No.	—	—	—	—	2,234	14,743
	SHEEP & LAMBS	United States ..	No.	—	—	—	—	1,707	—
		Canada	,,	—	—	—	—	—	501
		Total	No.	—	—	—	—	1,707	501
FRESH-KILLED	BEEF	.. Continent, etc. ..	Cwts.	—	3,883	45	2,093	5,252	2,426
	MUTTON	Continent, etc. ..	Cwts.	—	27,978	16,511	48,941	150,495	126,033
CHILLED	BEEF	United States ..	Cwts.	33	335,803	388,611	608,908	11,663	1,462
		Canada	,,	—	3,340	—	*est.* **41,820**	8	6,555
		Argentina	,,	124,538	1,073,102	1,275,647	1,702,186	4,649,718	5,216,022
		Uruguay	,,	23,721	58,891	171,117	289,113	160,412	31,982
		Brazil	,,	15,662	23,939	36,715	18,314	—	—
		Other Countries ..	,,	865	—	—	25	—	—
		Total	Cwts.	164,819	1,495,075	1,872,090	2,660,366	4,821,801	5,256,021

FROZEN	BEEF	Australia	Qrs.	210,859	1,028,888	591,998	1,143,779	1,236,466	1,084,832
		New Zealand	,,	223,906	557,146	639,684	482,232	321,784	126,750
		Argentina	,,	1,150,523	848,027	1,678,583	2,154,254	852,612	1,060,312
		Uruguay	,,	148,938	128,741	37,942	46,817	456,256	345,030
		Brazil	,,	103,307	29,919	44,236	27,145	—	—
		United States	,,	1,755,231	295,208	288,346	194,280	55,307	—
		Canada	,,	288,170	140,320	38,887	20,652	—	—
		Other Countries	,,	97,356	44,215	26,512	44,106	700	—
		Total	Qrs.	3,978,290	3,072,464	3,346,188	4,113,265	2,923,125	2,616,924
	MUTTON	Australia	C/cs.	23,506	602,119	270,959	2,179,952	2,088,222	2,983,751
		New Zealand	,,	1,188,787	1,525,883	2,410,126	2,830,233	2,616,650	2,249,705
		Argentina	,,	763,964	464,944	766,344	762,085	1,489,812	1,361,993
		Uruguay	,,	71,775	47,324	48,768	117,031	70,501	329,967
		Patagonia	,,	394,388	566,475	638,655	571,410	481,616	452,038
		Other Countries	,,	384	14,738	57,446	2,657	—	—
		Total	C/cs.	2,442,804	3,221,483	4,192,298	6,463,368	6,746,801	7,377,454
	LAMB	Australia	C/cs.	15,072	594,021	400,929	1,402,959	1,634,608	1,458,766
		New Zealand	,,	1,641,925	1,347,995	2,997,096	3,663,964	3,564,534	3,423,919
		Argentina	,,	198,498	415,636	444,174	313,796	599,044	391,537
		Uruguay	,,	—	3,061	2,930	19,664	2,110	7,597
		Patagonia	,,	172,482	251,310	410,580	327,610	241,742	276,892
		Other Countries	,,	75	4,489	24,729	—	—	—
		Total	C/cs.	2,028,052	2,616,512	4,280,438	5,727,993	6,042,038	5,558,711

III.—Summary of supplies of Beef, Mutton and Lamb showing total estimated *weight* available for consumption in the United Kingdom in each of the past six years :—

		1918	1917	1916	1915	1914	1913
HOME-GROWN Beef	Tons	783,200	787,500	833,810	815,050	815,970	799,300
HOME-GROWN Mutton and Lamb	,,	290,000	297,500	309,100	302,960	299,590	296,000
Total	,,	¶1,073,200	¶1,085,000	1,142,910	1,118,010	1,115,560	1,095,300
FOREIGN LIVE STOCK Beef	,,	—	—	—	—	718	4,739
FOREIGN LIVE STOCK Mutton and Lamb	,,	—	—	—	—	45	13
Total	,,	—	—	—	—	763	4,752
FRESH-KILLED, etc. Beef	,,	—	194	2	105	263	121
FRESH-KILLED, etc. Mutton and Lamb	,,	—	1,399	825	2,447	7,526	6,302
Total	,,	—	1,593	827	2,552	7,789	6,423
CHILLED Beef	,,	8,241	74,753	93,605	133,018	241,090	262,801
CHILLED Mutton	,,	—	—	—	—	—	—
Total	,,	8,241	74,753	93,605	133,018	241,090	262,801
FROZEN Beef	,,	376,618	231,332	259,203	296,961	200,875	197,243
FROZEN Mutton and Lamb	,,	104,477	127,054	181,003	232,946	252,462	260,213
Total	,,	**481,095	*358,386	‖440,206	‡ 529,907	§453,337	†457,456
Total of Beef	,,	1,168,059	1,093,779	1,186,620	1,245,134	1,258,916	1,264,204
Total of Mutton and Lamb	,,	394,477	425,953	490,928	538,353	559,623	562,528
GRAND TOTAL	,,	1,562,536	1,519,732	1,677,548	1,783,487	1,818,539	1,826,732

¶ Allowance made for reduced condition of cattle slaughtered.
** Deduct 100,000 tons re-exported.
* Deduct about 80,000 tons re-exported.
‖ Deduct 9,437 tons re-exported to France and other countries.
‡ Deduct 20,980 tons re-exported to France, Italy and other countries.
§ Deduct 35,407 tons re-exported to the United States, France and other countries.
† Deduct 6,644 tons re-exported to the United States.

Trade and Empire

There has been issued recently by Messrs. W. Weddel & Co. a valuable "Memorandum on the Imported Meat Trade (frozen and refrigerated) of the United Kingdom, with Suggestions for Fostering Production within the Empire." This communication fixes very pointedly upon the extent and dangers of foreign penetration. It goes so far as to state that the powerful group of American operators in the British import trade have secured a stronger position, while their British competitors have become relatively less strong, largely owing to the action of the British Government. The following have been the main factors in producing that result, viz. :—

(*a*) Placing a large proportion of the orders for army requirements in the hands of these American operators ;

(*b*) Commandeering and controlling Australian and New Zealand supplies, which formed the backbone of the British traders' business ;

(*c*) Permitting South American houses, chiefly American, to import considerable quantities of frozen meat for civil use, while preventing New Zealand and Australian houses from doing the same thing ; and

(*d*) (thereby) Destroying the productive and distributing organisations of British firms, while building up those of their American competitors.

In 1913 the world's output of frozen and refrigerated meat was 40 per cent British and 60 per cent foreign. In 1916 it was 31 per cent British and 69 per cent foreign.

Constructive policy is, of course, necessary for the future, and the memorandum devotes some space to recommendations for avoiding the dangers of foreign penetration in this trade, and making the Empire self-supporting. It asks a question : "Can Australasia, Canada, and South Africa make up the deficiency from their large but not fully developed stocks ?"

That is the crucial question. The reply must be: "Not at present, but we believe that in a few years' time, with proper encouragement from the Home and Overseas Governments concerned, they could."

As to remedies, we read: "First of all, it is necessary to interest the Home Government sufficiently to elicit from them some definite guarantee against the most favoured treatment, active or passive, being accorded to foreign producers, also a

SHORTHORN COW AND BULL CALF, ROYAL FARM, WINDSOR, ENGLAND

definite declaration in favour of encouraging Empire production.

"Meat required for feeding our troops, both now and in time of peace, should be drawn, firstly, from Empire sources so far as these will permit; secondly, from British suppliers of foreign-grown meat; and only lastly from foreign suppliers. Even if relatively full prices were paid for such Empire supplies as might be available for this purpose, no commercial treaties would appear to be violated, while the production would be fostered in the Dominions. The remainder of the meat pro-

duced there would come forward, as hitherto, for sale in the open market on shippers' account.

"If the Government were in this way to guarantee these army orders at fair prices fixed up year by year for five or seven years (or so long as the grain guarantees continue) fresh supplies of meat to compensate for the prospective Home shortage would doubtless be assured by the end of that period.

"The Empire-grown meat taken over by the Government would be limited to the army's requirements, so that in normal times the total army supply would be produced within the Empire, and the lines laid down for a speedy expansion of these supplies in any sudden emergency.

"The proposal might involve the making of special contract arrangements between the British Government and the Governments of the overseas Dominions, each colonial Government taking steps to distribute its orders amongst the various establishments within its territory, and to regulate and encourage the production of meat suitable for these contracts. The preservation of freedom of action in respect of all meat not included in such army contract would be an essential part of the scheme, if it is to appeal to British independence of character."

Complementary measures include :—

(*a*) Systematised improvement in the quality of stock in accordance with the needs of the British and other European markets ;

(*b*) Combination between producers and shippers, enabling long contracts to be entered into ;

(*c*) Standardised grading ;

(*d*) Regularity of sailings ;

(*e*) Concentration in selling ;

(*f*) Pooling of shipping, financing, and insuring facilities.

The memorandum concludes that the presence of the American Trust in Australia and New Zealand is a source of

weakness in any effort to establish the trade on Empire lines by private enterprise.

"The problems raised thereby can only be dealt with by each overseas State separately, but no satisfactory start can be made in that direction until the principle is definitely adopted by Great Britain, that foreign trading in the food of her people must be eliminated in favour of British trading."

CHAMPION HEREFORD BULL, GAINSBOROUGH, ENGLISH ROYAL SHOW, 1915. EXHIBITED BY MR. S. ROBINSON

Cattle at a Dam in Victoria, Australia

AUSTRALIA

At the last census in Australia there were 10,500,000 cattle and 80,000,000 sheep, and in 1891 there were 11,522,000 cattle and 103,260,000 sheep, but droughts, tick, red water, and harassing legislation have brought the numbers down to the lower level. It may be taken, however, for granted that, given the State politicians do not persist in their antagonism to the stock-owners, the number of stock in Australia can easily be increased very largely. In the case of cattle this is particularly so, because not many men are required to handle a cattle station, whereas the amount of labour required on a sheep property is large.

Australia is a vast country, with magnificent grasses for stock, and, with a good supply of labour, would be hard to beat by any country in the world. The State ownership of railways is a drawback, however, as under this system, unless continual British loans are forthcoming, railway enterprise in opening up new country is stagnant. Again, democratic governments never think of constructing railways unless there are sufficient votes along the proposed line to encourage them to do so. 'Tis votes that count all the time under State ownership of railways. Nearly £500,000 per annum is given the highly paid railway and tramway employees in New South Wales alone in the shape of free passes and concessions. This is passed on to the producer in higher freights. Another drawback is that it is almost impossible to get Government employees to take care of live-stock, and they consequently depreciate enormously between their fattening grounds and the meat works on the sea-board. The Australian railways are years behind the times in the matter of refrigerated wagons, and to all appearance nothing will wake them to the necessity of equipping their systems with means of bringing meat down to the sea-board dead rather than alive, also to the importance of making country life more

pleasant by transferring perishable produce to the outback towns in refrigerated wagons as is done in Canada and America.

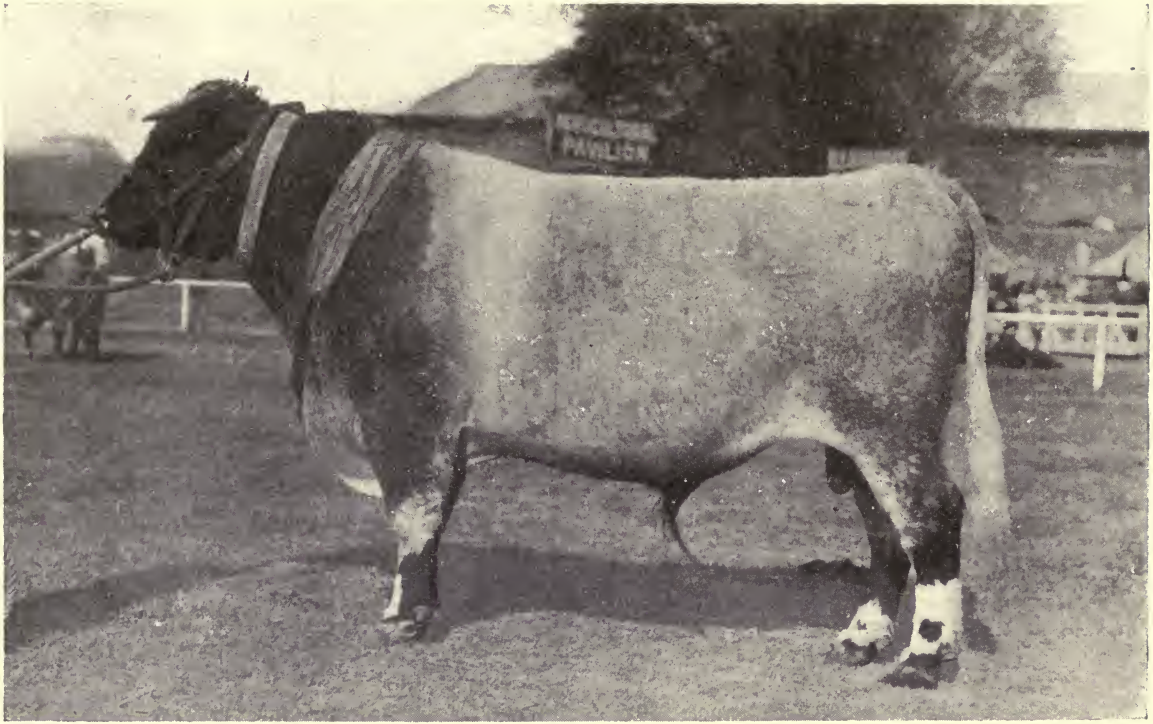
With the continued improvements in refrigerating machinery the chances of the chilled beef trade between Australia and the United Kingdom become more promising.

The chilled beef industry stimulates the bringing to a high degree of excellence the cattle of the country from which the

Mr. John McMaster's Stud Shorthorn Cow, Golden Duchess, Binnia Downs, New South Wales

shipments are made, for the primest beef is required for chilled exports. Chilled beef enters a high-class retail trade, where the demand is more regular and prices higher than for frozen beef. The chilling process does far more justice to good meat than does freezing, and it is difficult to avoid holding the view that the great bulk of the supplies of refrigerated beef for Great Britain in the future will ultimately be carried at a chilling temperature.

The largest amount of frozen meat ever sent away from Australia was in 1914–15. In that year five million carcases



Champion Shorthorn Bull, Lyndhurst Royal Peer, Brisbane Show, August, 1917
Calved November, 1908. Bred and exhibited by Mr. C. E. McDougall, Lyndhurst, Warwick

of mutton and lamb and over two million quarters of beef were exported; it will be many years before that record is beaten.

The constantly recurring labour troubles are alone sufficient to handicap the industry. The big meat works of Queensland, whence almost all the beef is exported, are continually brought to a standstill by the despicable behaviour of the unionists—I was going to say "the workers," but that is a

Reserve Champion Aberdeen Angus Cow, Scottish Queen, Brisbane Show, Queensland
Exhibited by Mr. G. C. Clark

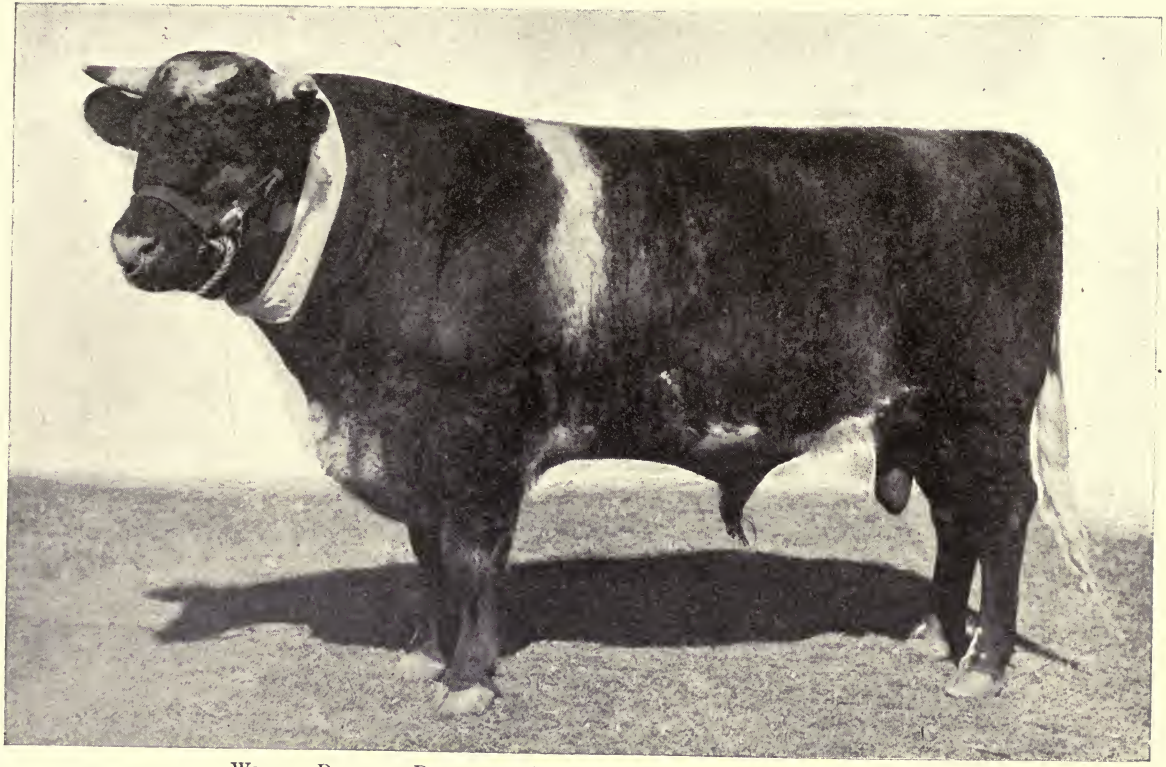
misnomer, they are *not* workers, and have little or no intention of being so. Backed up in all their demands by the present Government in that State, they imagine they have only to go far enough and the private companies will drop out and the Government will take over the works. Then when that comes about they believe they can loaf as much as they like, receive fictitious wages, and the loss will be made good by taxation and British loans. Such is the pitiable condition to-day of one of the finest and largest sources of a big beef supply, and, therefore, one is not at all sanguine of any immediate big

development from Queensland in the beef line. A normal export of from one and a half to two million quarters may be looked for at present and in the near future, but a big change in "Labour's" attitude must take place before any large increase can be expected. Queensland cattle kill at about an average of 640 lbs. dead weight at the meat works.

Great developments should take place in Western Australia in regard to cattle supply. There is an enormous area of excellent cattle country, and with freezing works at Wyndham and other ports, a big supply of frozen beef may be depended upon. This supply will be a fortnight nearer the world's markets than that of the Eastern sea-board, and necessarily the freight should be lower. The whole issue depends on the Government; with just legislation, security of tenure, and decent labour there is nothing to prevent Western Australia rivalling, and even beating, Queensland in her beef output. As regards mutton—sheep and lambs—everything points to a larger supply than formerly throughout the Commonwealth. Cross breeding has been gone into very extensively, and many men are now breeding for export sheep and lambs. Under decent conditions and with a Government with brains sufficient to encourage the men on the land to increase and multiply their flocks and herds, Australia alone should easily be able to supply Great Britain with all the mutton she may require. Recently the Hon. D. J. Gordon, of Adelaide, read a paper before an Interstate conference of meat exporters in Sydney on the Live-Stock Industry of Australia. This was reprinted in *The Pastoral Review*, and as it gives the views of breeders, I reproduce it here with confidence:—

Causes of Shortage in Live-Stock and Suggested Remedies

There have been many contributory factors to the want of vitality in Australia's leading industry, and the serious shortage in live-stock as disclosed in the latest statistics. With a view to investigating the causes I sent circulars to a number of leading stock-owners, and asked for replies to the following



WILGUL DUKE OF DERRIMUT, CHAMPION SHORTHORN BULL AT SYDNEY
Aged 2 years 8 months. Bred by Messrs. Parsons and Robertson, Vic., and exhibited by Mr. John James, Vic.
Sold to Mr. Norman Falkiner, Pranjip Park, Vic., for 1100 guineas.

questions. The summary of the replies received is of special importance, since it represents the views expressed by men of experience who are in the business :—

1. What are the main causes of the shortage of sheep and cattle in Australia ?

Droughts at intervals, and the exceptionally bad season of 1914. General want of confidence in trend of legislation, overstocking, and destruction of natural herbage. Breaking up large estates and dispersal of flocks and herds—often stud sheep and cattle. Failure of small settlers to keep stock. Inadequate transport facilities, and neglect of State-owned railway managers to provide facilities similar to Argentina, United States, and Canada. Big saving of stock would be possible even in worst droughts if railways were adequate and the management responsive. Increasing burdens of taxation and general political vendetta against live-stock industry. Demands of labour unions and harassing awards, causing increase in cost of production and difficulty of working runs. Rabbits and wild dogs.

(The consensus of opinion puts drought first, then dispersal of big flocks to meet demand of closer settlement, third, legislation and taxation, and then insufficient railway systems.)

2. What are the best methods to adopt to build up the flocks and herds ?

A political truce and fair treatment to stock-owners. Link up railway systems and improve same. Abolish breaks of gauge and make the railways responsible for damage to stock. Educate small settlers to keep sheep and cattle. Encourage stud breeders. Remove embargoes and abolish restrictive legislation, which prevents stock passing from State to State. Cultivate grasses and fodder crops for stock and carry reserve supplies against dry seasons. Offer every inducement to secure occupation of outside country. Systematic campaign against rabbits and wild dogs. Security of tenure. Increased water supplies.

3. Is it possible to increase the live-stock beyond the highest point yet reached in Australia, and if so, how ?

Not unless outside country and central and north Australia can be opened up by railways and stocked. By farmers carry-

ing small flocks and a few head of cattle. One correspondent advocates a "campaign of education" amongst small settlers.

(Several authorities doubt if the highest water-mark will be reached for very many years owing to the dispersal of big flocks and herds; others state that irrigated lands along the Murray and higher prices for meat will encourage breeding up.)

4. In what direction do you look for an expansion of the pastoral industry?

Several correspondents take the view that there is little prospect of expansion in face of growing taxation, industrial unrest, rising wages, and inefficient labour. Others state that any growth will depend upon successful occupation of central and northern Australia, growth of confidence, and removal of restrictions. If meat and wool prices remain relatively high they may restore vitality to a languishing industry. One correspondent says: "The industry requires large reserves of capital, and men who can command capital are being driven out of the business." Increased liberal land laws are advocated.

5. Can the sheep and cattle of Australia be improved on the meat side, and if so, how?

Introduction of better bulls from England, especially on "early maturing side," is strongly advocated. Most correspondents contrast the prices paid for stud stock in England by breeders in the Argentine Republic with the lack of enterprise on the part of Australians in keeping up a standard.

(There is a consensus of opinion that both cattle and sheep can be improved on the meat side with all-round advantage. For export meat trade cross-breeding of sheep is recommended.)

6. What improvements do you recommend in the carriage of live-stock on the railways?

Railway management in almost all the States is strongly condemned. One well-informed correspondent, with exceptional experience, says: "The whole system of carriage of stock on railways requires remodelling. State railways should be made 'Common Carriers,' and be responsible. An expert should be imported on behalf of all the States—preferably from Argentina—to revise the whole system. Stock should be watered on long-distance runs, and stock trains should run to schedule time." Also, votes at General Elections should not

be allowed railway employees. They should elect their own member to represent them. Other suggestions are : Quicker transit, better trucks and loading, more care by engine drivers, resting depots on long journeys for water and feed, stock trains fitted with air brakes.

7. Can the pastoral industry be encouraged by better land laws ; if so, in what direction ?

Security of tenure and full compensation for improvements. Liberal land laws and reduction of taxation for purely stock country, and exemption from Federal land tax of outside leases.

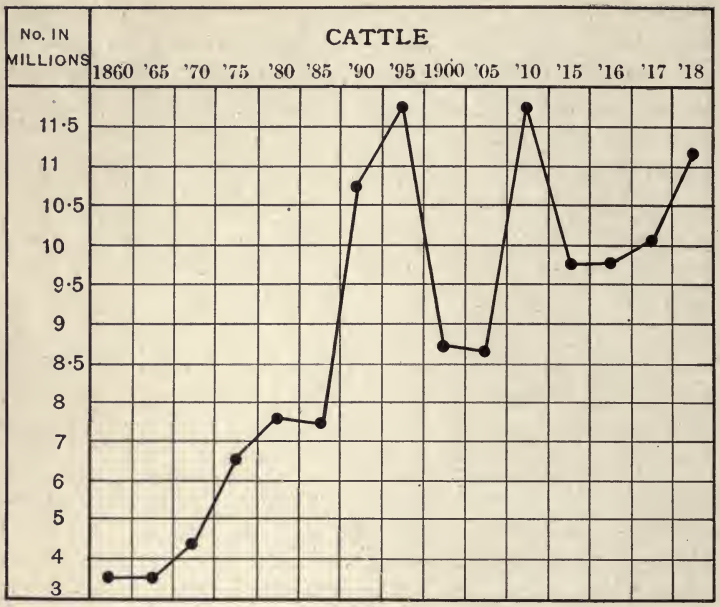
8. Do you look for increase in sheep and cattle from Murray River reclaimed lands, and from closer settlement areas ?

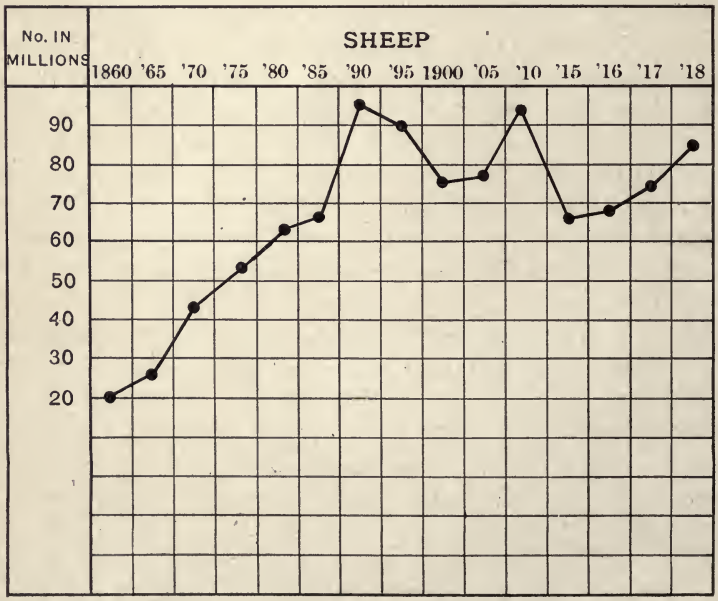
Only to limited extent unless prices warrant intense culture and hand feeding.

9. Do the cattle and sheep of Australia compare favourably on the meat side with the live-stock of other meat-exporting countries ?

One correspondent who has visited Argentina writes : " The cattle do not compare favourably. The average dead weight beast from Queensland is much less than the Argentine average." A gentleman of many years' practical experience in the meat trade of South America says : " Argentine breeders are always importing stud stock to keep up the standard. There is room for improvement in Australian cattle and better methods of droving—less stockwhip and rough handling—and better methods of dressing are essential in respect to mutton and beef intended for export. Australian sheep are splendid, especially Merinos, on the wool side, but bigger carcases are needed for export."

The following diagrams show in graph form the rise and fall of meat production in Australia during the last half century :—


No. IN MILLIONS
CATTLE
1860 '65 '70 '75 '80 '85 '90 '95 1900 '05 '10 '15 '16 '17 '18
11·5
11
10·5
10
9·5
9
8·5
8
7
6
5
4
3


No. IN MILLIONS
SHEEP
1860 '65 '70 '75 '80 '85 '90 '95 1900 '05 '10 '15 '16 '17 '18
90
80
70
60
50
40
30
20

A leading breeder with experience of the "inside" and "outside" country, who is specially competent to take a broad view of the general situation, writes: "After looking into your questions I think it all comes back to the lack of confidence that has been firmly established in the minds of those who hold land of any description that the trend of legislation is to 'kill' rather than foster the development of the pastoral industry. We are prepared to face droughts, dingoes, and rabbits, as we know something about them, and how best to fight them, and we have confidence in ourselves, but they are as nothing compared with the uncertainty of land legislation. The man with capital who would be prepared to face all the risks and develop and improve his holding stands down and gives way to the speculator, who only holds to get out at the first favourable opportunity. This class of pastoralist is no good for developing country or improving stock. The State could do better without him. The practical man who has the means looks to the future, and providing he could feel confident of being undisturbed by his landlord, would be ready to tackle all the other odds against him. Rabbits, of course, have killed much or nearly all the drought-resisting stock fodders or plants, and a great portion of southern pastoral Australia will never again be capable of carrying the same quantity of stock. There is much of Australia that can be settled and developed, but legislation must restore confidence, which has been so sadly shaken that I question whether we will ever again see private enterprise as enthusiastic as in the past. Certainly not till railways are extended, with branch feeders, will the out-back country be taken up and settled. The stud-breeder in the inside country and the pastoralist out-back can successfully fight and withstand droughts and keep vermin within bounds, but the legislator can kill the freeholder and the Crown lessee by a stroke of the legislative pen. And he is doing it, and that spells national disaster."

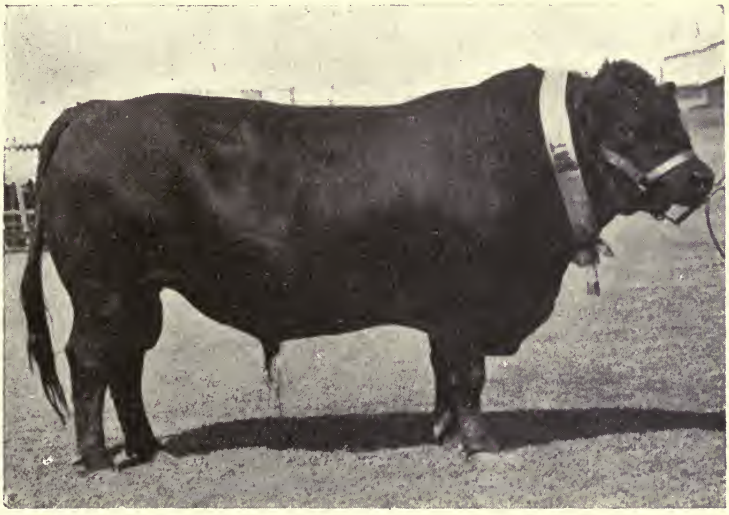
Climatic Control of Production

Mr. Griffith Taylor, B.Sc., B.E. (Physiographer to the Commonwealth Meteorological Bureau), recently issued a pamphlet under the title "The Climatic Control of Australian Production." He has made "an attempt to gauge the potential wealth of the Commonwealth," and certainly that is one of the first steps to take to promote rural expansion.

It would appear from Mr. Taylor's scientific deductions that something more than natural climatic conditions is required to enable the Commonwealth to carry with safety an increasing number of cattle and sheep. The locking of the rivers, the extension of irrigation, a greater use of artesian water supplies, the cultivation of grasses and fodder crops will in time increase the carrying capacity of the country. In this connection it is worthy of note that during the period that New Zealand was developing its meat export trade, and the population was growing, live-stock steadily increased in numbers. Up to the present time Australian live-stock owners have given little attention to the growing of feed supplies, while stall feeding in shelter sheds, though shown by experiments to be profitable, is not practised to any appreciable extent, for the reason that decent labour which will give a fair day's work for a fair day's wage is unprocurable. It was Charles Dickens who once remarked at an agricultural dinner that "the field which paid the farmer best to cultivate was the one within the ring fence of his own skull." That statement contains a more important truth to-day than it did in the time of the great novelist. Science is conspicuously aiding the tiller of the soil who places himself in a position to be assisted. Improved ocean transit has brought the producer in Australia and the consumer in the centres of population in Europe closer together, and the refrigerating chamber is opening up almost unlimited opportunities for the expansion of trade. The remarkable success which attended experiments made in New Zealand in the eighties in the shipment to England of frozen meat compelled Australian breeders to look askance at the "boiling-down" works which were employed for the purpose of dealing with

One of the Paddocks on Mr. M. W. Roberts' Yathroo Estate, Dandarragan, West Australia

surplus stock in times of plenty, and relieving the pressure when droughts came. With a threatened scarcity of feed and water before them, pastoralists were sometimes forced to sacrifice their stock in a flooded market. Sheep used to be killed for the sake of the skins, and the carcases either left to rot on the ground or were sold for a few pence per head to the owner of the nearest boiling-down works and turned into



CHAMPION ABERDEEN ANGUS BULL, HEATHER DUKE, AT BRISBANE SHOW, Q., 1918
Exhibited by Mr. J. McIntosh

tallow. The advent of the freezing process and the refrigerating chamber in steamers altered all this, and the day of the "boiling-down" works passed away never to return.

RECONSTRUCTION AND EXPANSION

A critical period has been reached in the business of raising live-stock and in the export of meat, and the vital question is: How can the drift be checked and the industry placed upon a firm foundation? The foregoing review and opinions expressed by practical men show clearly enough that while climatic conditions impose distinct limitations, there are other

explanations for the stagnation in the industry and the want of confidence which is causing owners to curtail operations, and preventing others from taking up country and stocking it. The pastoral occupation of the outside country is of fundamental importance to Australia. It is the only way to develop natural resources, people an empty continent, keep the factories of the Commonwealth open, and provide employment, while checking the fatal preponderance of the metropolitan

Reserve Champion Hereford Bull, Sir Hamilton,
Brisbane Show, Q., 1918
Exhibited by Mrs. Lumley Hill

population. In no other way can waste places be made productive. By increased production alone will it be possible to meet growing national and private obligations. Australian manufacturers depend wholly on home markets, and are not likely to become exporters. They must look to the stock-owner, grain-grower, and dairyman for orders, and similarly the earning power of State-owned railways and State-controlled harbours and ports will fluctuate with the varying fortunes of the primary producers.

Is it too much, then, to ask that the Parliaments of the Commonwealth and States shall call a halt to their more or less

LINDENOW DUCHESS OF DERRIMUT 8TH, 4 YEARS OLD
A. J. Webb (Vic.). Champion Cow of Australia, dam of Champion Bull of last Melbourne Show

relentless pursuit of the man on the land, and that wiser counsels shall prevail to the end that methods may be employed to restore vitality to languishing rural industries? Australia should be able to provide a cheap meat supply for its own people, and build up a larger and more prosperous oversea trade in wool, meat, skins, and hides, but before this can be accomplished the growing burden of taxation must be lightened or better distributed, and the paramount importance of the live-stock business generally recognised.

Champion Shorthorn Cow, Cornflower 2nd, Brisbane Show, Q., 1918
Exhibited by the Lomax Pastoral Co.

A serious menace to which special attention deserves to be drawn is the dispersal of high-class stud flocks and herds, upon which foundation stock-raising has been built and must be maintained. Without that foundation there can be no substantial growth. On the contrary, flocks and herds will deteriorate. Some States are noted for a special type of sheep, and it is from the pure studs that drafts are continually drawn to maintain the great wool trade and the growing meat export business. These "types" can only be produced and kept to standard on good inside country, but the imperative demands

of two departments of taxation—Federal and State—make the business of studbreeding a doubtful proposition. Instead of stud flocks and herds increasing they are decreasing, and that factor in relation to Australia's hitherto leading industry can neither be disputed nor discounted. It represents a danger-signal.

In some countries private railway companies offer reduced rates for the carriage of stud animals as an encouragement to breeding which will bring business to the railways. The State-owned railways of Australia charge more for stud stock—sometimes as much as ten times more than ordinary rates !

In this and other respects there is much that railway managers could do to encourage live-stock raising. Owners and agents are unanimous that stock trains should be fitted with air brakes and run to schedule time, and that provision should be made for watering animals on long-distance runs. State Governments might well combine to send a first-class man (not a Government official) on a world tour to inquire into various systems of carrying live-stock, or import an expert to revise our inadequate system. The pastoralist is the best customer the railway departments have, and it will pay to respond to his requirements and help him to extend his activities and send more produce over the railways.

The extension of railways into central and northern Australia, the gradual elimination of varying gauges, conservation of surface waters, and the multiplication of artesian bores are Governmental activities calling for prompt attention as being among the means of giving much-needed vitality to the live-stock industry. There is also a distinct call for an educational campaign, more particularly among small settlers, concerning the advantages of keeping stock, the best breeds for given localities, and the profits to be derived from feeding and sheltering stock. *The Pastoral Review* is a handbook of practical information for those stock-owners who read at all, and the Australian farmer is fortunate to have such a publication. Many, however, do not read anything at all, and among this class a campaign is required. The various agricultural departments are singularly weak on the stock side, and little is being done in an educational way to conduct experiments or carry conviction to the small stock-owner.

Fat Bullocks at Taabinga, Queensland

Restore confidence among the men engaged in the industry, and those who would willingly enter the business, and there will be no hesitation in even rivalling the purchases of breeders in the Argentine of high-class stud cattle in England, and the introduction of strains that will improve sheep on the meat side. It was the stud-breeder who added several pounds of wool per fleece and produced a wool of unequalled quality, and the same skill is available and waiting to be utilised on the meat

Reserve Champion Shorthorn Bull, Lyndhurst Royal Peer 11th, Brisbane Show, Queensland
Exhibited by Mr. C. E. McDougall

side. That there is the same pioneer spirit of adventure and power of endurance available to make conquests in remote parts of Australia has been proved beyond all doubt by young Australians in the great war. Given the opportunity, they will prove worthy sons of the men who have made Australia. The stuff of which pioneers were made is still with us.

In the matter of taxation it must be admitted that a Federal graduated land and income tax on the top of State and local imposts represents a crushing burden to those engaged in wool-growing and meat-raising. Specific cases have been given to me where two-thirds of income goes in taxation! It has

taken the whole of the wool clip of one pastoralist for two years in succession to meet the demands of the tax collector, and stock had to be sold to meet working expenses. One correspondent writes : " Leaseholders are now taxed as well as the freeholders, and the extraordinary assessments put on leaseholds is reducing their values enormously. One leasehold of 248 miles, 120 miles from a railway, was assessed at the commencement of a 42 years' lease at £10,000 unimproved value. It

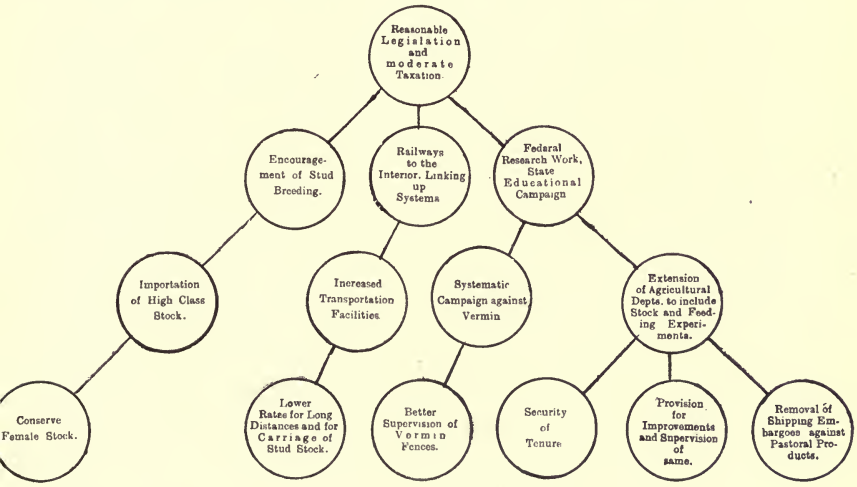
Stud Shorthorn Bull Baritone, Champion at Sydney Royal Show, 1918
Purchased for 1700 guineas by Mr. John McMaster, Binnia Downs, New South Wales

should not have been worth £1000 ; yet with 29 years to run it has been assessed at £7790. Four years ago £12,000 was given for it, with 8000 sheep and nearly £5000 of improvements; £3000 worth more of improvements were put on before the assessment. Such assessments will make men hesitate to take up leaseholds. Men will take big risks for fair dividends, but when they are to be taxed heavily on returns made in good years, and get no allowance in bad years, they are not likely to put their money into industries which are so viciously attacked by our Legislatures."

There is not only the problem of reconstruction to be faced,

but the greater problem of the expansion of the live-stock industry. The practical question is how best to meet this national obligation. It is not a political question—certainly not a party one, since every section of the community will be vitally affected by the fluctuating fortunes of rural producers. It is an economic problem of first-class importance—a national enterprise which transcends all political and other considerations.

There are at least eight essentials before the live-stock industry of Australia can be reconstructed and vigorous growth



made possible : (1) A better appreciation on the part of legislators of the requirements of the industry and the difficulties of successfully occupying the interior of the continent ; (2) special encouragement of stud-breeding ; (3) increasing transportation facilities ; (4) revision of taxation and charges borne by the industry in order to prevent an undue pressure causing a decrease in production ; (5) campaign of education to encourage small flocks and herds ; (6) experiments in closer settled areas in feeding ; (7) removal of shipping restrictions and harassing regulations ; and (8) vigorous methods to deal with pests and vermin.

An attempt has been made in the accompanying diagram to

illustrate the scope of investigation and reform necessary to place the industry on a practical and profitable basis.

All this means national organisation, and national organisation is only a convenient term for expressing the highest form of State co-operation with individual initiative and intelligence without the domination of either. We want, more than anything else in Australia, on the economic side of life, a new era of primary production, a new spirit of conquest, renewed enthusiasm, the creation of more wealth, so that the Common-

Champion Shorthorn Bull, Grand Duke of Clifton, Brisbane Show, Q., 1918
Exhibited by the Lomax Pastoral Co.

wealth may carry a larger population, and that there may be national progress based upon better conditions and a standard of comfort greater than that of any other country. All this is easy to accomplish, and in no direction can it all be made possible in less time than by the systematic conquest of natural resources—the promotion of rural industries, of which the greatest and most profitable for the nation is that of wool-growing and meat-raising for home requirements and unrestricted sale oversea.

It is by organisation—national and individual—Govern-

mental activity in investigating, experimenting, and educating, so that the citizen shall be well equipped when coming into daily grips with problems in field and factory and world-wide competition—that the urgent call for efficiency, economy, and human uplift can find adequate response. Economy in production, saner methods of distribution, and only such legislative control as will give a fair field to the mutual interests of industrially employed capital and labour represent the corner-stone of a true democracy. Before they can hope to people

Champion Hereford Bull, Magnitude (imp.), Brisbane Show, Q., 1918
Exhibited by Messrs. Tindal and Son

their vast continent with a virile white race, Australians must understand the fundamental economic factor of national safety and progress, that it is production, and production only, that creates wealth, pays wages, regulates prices, and fixes the standard of living. The neglect of a country's natural resources is economic waste, and economic waste means public and private loss and eventually national decay.

The Indian Zebu for Australia

If it is possible to obtain the consent of the Federal Government to their introduction, it is very probable that a large

consignment of Zebu bulls will be imported from India into the Northern Territory.

The breed is tick-resistant, and will fatten practically where our own stock would starve. In parts of the Northern Territory and the north-west, where our cattle suffer large losses from disease and numerous insect pests, these Zebus would thrive and prove a source of profit on thousands of acres of country at present unoccupied. The illustration herewith shows the fine type of cattle that results from the mating of

CHAMPION HEREFORD COW, JEAN, BRISBANE SHOW, Q., 1918
Exhibited by Mr. J. Sparkes

the Zebu and the Shorthorn, and the following extract from a letter from Mr. William McDowall, Christmas Creek, Charters Towers, Queensland, to the Royal Zoological and Acclimatisation Society of Victoria regarding a Zebu bull sent him by the Society, is worth quoting :—

"The white bull I got from you is a very big beast now, and very quiet ; his calves are a year bigger than ordinary cattle, eat dry grass in the heat of the day, and get and keep fat where ordinary cattle die ; they seem to be immune to all diseases ; we never wash or spray them for ticks, and we never even see a fly or insect on the bull himself."

The best of these bulls are largely purchased for America, where they are used with success, for grazing purposes, and Americans would not use them, with the experience they have had, if they did not pay them.

The Zebu-Shorthorn cross is immune from tick fever and tick-conveyed diseases, and some interesting information on the subject was recently contributed by Mr. A. Despeissis to the Department of Agriculture in Western Australia. He said :—

"I was collecting information regarding the purchase and shipment to this State of heavy milking Maltese goats, and while discussing the matter of 'Maltese fever,' which these animals are likely to carry, some interesting experiments, consisting of crossing Zebu cattle (Bos indicus), popularly known as 'Brahmans,' with ordinary cattle, were brought to my notice. The object of these experiments was to ascertain whether Zebus themselves or their crosses are immune from 'tick fever,' or 'piroplasmosis,' which is very severe in portions of Algeria.

"The fact which suggested the experiments was that Madagascar, a French colony heavily stocked with humped-back cattle (a strain of Zebu), was free from tick fever, although the tick insects themselves abound there ; moreover, in the South African colonies where the humped-back cattle are not bred, European cattle are severely affected by 'red water.'

"One permanent remedy, however, now seems to be suggested as the result of the experiments referred to, i.e. the infusion of Zebu blood into ordinary cattle subject to infection. The attention of a landed proprietor near Bona having some years ago been drawn to the fact that a couple of Zebus he possessed and their crosses were always in good condition, whilst the cattle around suffered greatly or died from the attacks of cattle ticks, led to a careful investigation being made, with the result that it was found that Zebus and their crosses are not so susceptible to the attacks of cattle ticks, and although the micro-parasites of the blood may occasionally be seen on microscopical examination, no ill-effects follow.

"The secretion from the sebaceous glands of their skin has a peculiar odour, which seems repugnant to insect life. The hide, though it may be as thin as in European breeds of cattle,

appears to be much tougher ; the hair is quite short, and does not provide favourable shelter for the development of ticks."

This cross seems to be to the ox what the mule is to the horse ; it partakes of the qualities of both parents, but, however, remains fertile. To the ox it owes its succulent flesh and humpless back ; to the Zebu the smaller bone and quick growth, greater activity, hardiness, and resistance to tropical diseases. The Zebu is a tropical ox, and resists there where it has been proved other cattle are carried away by disease. It

THE ZEBU-SHORTHORN CROSS

is not affected either by the damp heat or by prolonged drought, which favour such diseases as piroplasmosis, but it cannot stand too much cold. It will prove a useful animal for our tropics, while in milder climates it is not required.

A description of one of the three Zebu-Shorthorn cross raised by Mr. W. McKenzie Grant, near Dongarra, W.A., is interesting. The cattle were sired by a Derrimut Shorthorn bull, the dam being a Brahman cow, a little hump-backed animal weighing 350 lbs. or so dressed, and standing eight or nine hands, and which had for many years occupied an exhibit pen at the Zoological Gardens, South Perth. The respective live weights of the trio were as follows : 2240 lbs. (six years old),

1840 lbs. (five years old), and 1750 lbs. (four years old). They were very quiet. The dressed weight of the two smallest was 1036 and 1026 lbs. respectively, that of the heaviest 1270 lbs. ; the hides about 90 lbs. green. The beef the butchers pronounced A1 ; 2 to 3 in. of fat all over the carcase ; not very much kidney and caul fat.

" I have purposely dilated on this important discovery," says Mr. Despeissis, " which affects the 600,000 head of cattle we have in the north and north-west, and particularly the half a million head known to be already in the Kimberleys. Indeed, this matter is one which affects the whole of the Australian tropics, where the cattle tick decimates the herds.

" If this method of combating the plague is found successful (and it appears to have been in countries such as Brazil and Uruguay), its value to Australia would be enormous."

Fixing Prices

In these days of fixing prices, it is natural that one should turn to history to see if similar experiments have been tried in the past, and how they succeeded.

In the year 1815, the British Government, with a view to encouraging agriculture, passed a law and fixed the price of wheat at 80/- a quarter. The law was operative only for a short time, when, in spite of the penalty imposed, wheat was bought and sold at 38/- a quarter, and the statute became a dead letter. A little further back, in the years of the French Revolution, price fixing was the order of the day, and very heavy penalties were imposed on those who failed to bring their produce to market and offer it publicly at the price fixed. The price of wheat was fixed, the price of oats, and the prices of many other things. Instead of having the effect desired, it had the opposite. The low prices fixed caused production to fall off in all directions, and products, especially wheat, became scarcer and scarcer, until bread was almost unprocurable. Every night, long before daylight, crowds gathered at the bakers' shops, and when daylight came fought for the few loaves offering. Children were starving on the highways, and it was a common sight to see women with children in their

arms fighting for a crust. The peasants said they would sooner eat their oats themselves than sell them at the price fixed by the Government. The law fixing prices was called the law of the maximum. Professor Sybel, in his famous history of the Revolution, says: "There was great distress all through France owing to the Government putting a fixed price on corn" (wheat). "Owing to the law of the maximum, all goods began to avoid the market." "The law of the maximum first frightened the goods from the market and then paralysed production." "The law of the maximum had the effect of impeding trade and preventing the regular supply of goods to the people." Then the professor goes on to say: "The case was not so bad in most of the departments with regard to meat, as with bread, because the law of the maximum had forgot to fix a tariff for live cattle, and the peasants had, therefore, slaughtered as few beasts as possible in Robespierre's time, and now brought to market and sold as much meat as was wanted at good prices." "There was plenty of meat obtainable, because the law of the maximum did not apply to cattle." Less than five years of this interference with trade on the part of the Government brought the people to such a state of destitution and misery that at last they awoke to the folly of trying to override natural economic laws; and the National Assembly swept the whole of this legislation from the statute book. Then business began immediately to revive. The celebrated economist, Henry Dunning Macleod, in dealing with this question, says: "Does not everyone know that a high price of corn is the way to attract corn where it is deficient, and a low price the way to repel it from where it is already too abundant?" Then he goes on to say: "There is a period during which sales are difficult or impracticable; when the prices are at the maximum the buyer refuses to submit to them; and when they are at a minimum the seller refuses to submit to them." Macleod declares that supply and demand are the cause of value. This, of course, is where there is free competition.

The Federal Government will do well to pause before attempting to fix arbitrary prices for beef and mutton. There are few farmers who do not combine grazing to some extent

with agriculture, and who in bad seasons for wheat do not rely on their live-stock to pull them through. This question deeply affects the two great primary industries of the country. The graziers and farmers of Australia will have to bear the greater part of taxation resultant from the war. In addition, they have their periodical losses through droughts, and are having it badly in the Eastern Division at the present time. The higher prices they are getting for their fat-stock now will not be all loss to the consumer. The owners of live-stock will pay a correspondingly greater amount of taxation, which will relieve other sections of the community to that extent. The fact that fat-stock have reached such high prices must act, and is acting as a powerful stimulant to stock-owners to make every possible effort to increase their flocks and herds. When sheep and cattle were cheaper, stock-owners sent large numbers of their female stock to market; not so now. Everyone is hanging on to his female stock with a view to increasing the numbers as fast as possible. This is assuredly one of the causes for the high prices obtaining; but it is only temporary. It is a fixed and immutable economic law that the dearer any product is the greater will be the effort to produce it. For instance, let the price of wheat be 6/– per bushel, and the industry will bound ahead; but let the price be 3/– per bushel, and the industry will (in the words of Lord Macaulay) droop and wither like a plant in an uncongenial air. The most powerful stimulant to production is gain.

Cattle Prospects in Western Australia

Western Australia is so big a country, and subject to so many differing conditions, that any general description of the cattle industry is impossible; the only way to gain a clear understanding of the position is to take the divisions of the State separately.

When statistics were published at the end of 1917, the State possessed 958,484 cattle, as compared with 863,930 at the end of 1916, and 754,377 in 1907. There had then been an apparent steady increase during the previous ten years, but this increase was almost wholly in the Kimberley division, which

lies in the extreme north of the State; and, as a matter of fact, the main North-west division, which has been discarding cattle for sheep for many years, had gone back in its numbers.

Kimberley is the cattle end of the country, as will be shown by the following table :—

Statistical Division.	Cattle at 31st Dec., 1917.
East Kimberley	.. 265,604
West Kimberley	.. 408,366
North-west	.. 61,917
Gascoyne	.. 49,890
Murchison and Goldfield	.. 73,349
Agricultural Areas	.. 99,358
	958,484

The figures show that East and West Kimberley now possess 673,970 cattle, or more than two-thirds of the herds of the State. The growth in Kimberley has been rapid, as at the end of 1907 the totals were 463,735 for the two Kimberleys, so that the increase in the ten-year period has been roughly 50 per cent.

Kimberley has been one of the most neglected corners of the earth. Blest with magnificent soil and noble rivers, it has been cursed by misgovernment and neglect. When freezing works and canning plants years ago might have given the country a market, cleaned up all the aged cattle, and encouraged the lessees to open out the country, the Kimberley squatters have only been able to market some 25,000 cattle annually, by shipment to Fremantle, six days' steam southwards, or to occasionally get rid of a few thousand store bullocks to Queensland.

The absence of markets has been pronounced, and has for many years induced a condition of things closely akin to stagnation. Owners have kept down their breeding, as it was no use going to the expense of improving the back country and carrying more cattle till the runs earned more money than a bare subsistence from the infrequent sales. And consequently the country has never really been used, developed, or stocked. All that the lessees have done, up to the present, is to run the frontages of the rivers and leave development till later on. The cattle seldom work back more than seven miles from the

rivers, and all the rest of the occupied runs is really waste. There are still considerable areas which have never been taken up ; some of it on account of the blacks, who are troublesome in the back country.

But all accounts agree that there is any amount of room for a big increase in the Kimberley lands when the back country is opened out and provided with water. The West Australian Government has now erected treatment works at Wyndham, and although they are largely a failure in that they have cost a ruinous price to build, and that they can only offer the East Kimberley pastoralist $2\frac{3}{4}$d. lb. for his beef instead of its value on the Queensland coast, still they will open out some sort of a market for the country ; and with the dawn of better days the Government may perchance write off the £350,000 to £400,000 of waste due to Departmentalism and day labour, and hand the concern over to the growers to run for themselves. In any case the Wyndham Works represent the beginning of a new chapter in the history of Kimberley, which will be progressive in exact proportion to the removal of the Government blight upon its marketing facilities, and prosperous as that consummation is effected. Some day also freezing works must surely come to Derby, the front of West Kimberley, to terminate the day of cattle shipments southward, and their waste of 100 lbs. per bullock, and to ship away the product of the country in cold storage, or in tins, with the tallow and hides.

Working southwards from Kimberley we come to the North-west and Gascoyne divisions—a huge and partly opened-out country, running some 111,807 cattle, or less than there were ten years ago, when there were over 122,000 cattle in these provinces. From this country a portion of the beef supply of Perth is drawn, and notwithstanding the importation of 20,000 cattle from Kimberley in 1916, and 10,000 in 1918, the consumptive drain upon the country is more than it can stand. There are not 3000 bullocks of marketable ages north of Meekatharra and south of Wallal to-day ; and there is every indication that in a year or two it will be difficult to keep pace with consumption.

There is plenty of cattle country vacant in the North-west,

but no one is troubling about breeding. Sheep pay better, and the cattle question is left to look after itself. No doubt, as export develops and the whole country advances, the cattle numbers will increase, and increase considerably.

On the Murchison and the Eastern Goldfields there are some 73,349 cattle, over 20,660 of which are held round Kalgoorlie, which is, for the first time in its brief history, able to eat its own roasts for a considerable portion of the year. There is still much unoccupied country in these divisions, but, served as the country is with railways, it is more likely to increase its sheep numbers than its cattle. The country along the Great Western Railway, too, may probably run some cattle, but the chances are that here as elsewhere sheep will be the objective.

Lastly, we have the agricultural areas of the South-western Division, which ran 120,582 cattle ten years ago, and only counts up 99,358 to-day. The South-west is not a cattle country, and the most that can be hoped for is the development of dairying in the improved country, and a gradual but slow increase, perhaps principally of dairy breeds, and to a lesser degree of beef breeds. But that increase is not likely to be sudden or considerable.

From this sketch it will be seen that Western Australian increase will be in the tropics and very largely in proportion to the development of cold storage. Southwards, as the population grows, there is little probability of any noticeable increase in the day of this generation. And even if the present figures were doubled they would still be inconsiderable.

NEW ZEALAND

THIS stock-owner's paradise stands alone among all other countries that I am describing as being an ideal stock-raising country, with the healthiest of climates, an absence of serious stock diseases, with the richest of pasture, and the industry of its farmers. New Zealand farmers need never fear that labour troubles are going to block their progress, because they are in the happy position of being able to do all their own work at any pinch which may occur. Unionists have tried in the past to block the shipment of the farmers' produce, but have been badly beaten every time, until now they recognise that it is to their interest to work satisfactorily. Another reason why New Zealand is a good and progressive country is because the bulk of the people own property, mostly of moderate dimensions; therefore, it is hard indeed for socialists or anarchists to get elected to Parliament.

New Zealand's sheep, at last census, amounted to 26,538,302, and cattle 2,500,000. Her exports of mutton and lambs in a pre-war year amounted to 2,500,000 sheep, 3,500,000 lambs, and 55,000 carcases of beef, the mutton and lamb shipments alone amounting to 25 per cent of her flocks.

In the North Island the sheep are almost entirely fattened on grass; but in the South Island, particularly in Canterbury and Northern Otago, on root crops. The bulk of the beef exports are shipped from the North Island. As will be seen by the list of the meat-works at the end of this volume, New Zealand is well provided with them in every part of the country. Most of these, at the present time, are full of frozen meat of all kinds, and a vast reserve is awaiting Great Britain directly shipping resumes its pristine activities.

It was thought, some years ago, that New Zealand could not much increase its flocks and herds; but scrub country, and native lands in the North Island, still offer great pros-

pects for stock-raising of all kinds, and land which has been ignored in past years, for its poor quality, is now being found to be good healthy stock country.

A country such as this is only needs men who are not afraid

A War Worker

The little Maori Princess who shepherds Mr. C. H. Ensor's Corriedale sheep at White Rock, Rangiora, N.Z

of work, to continue to be regular large supplier of food-stuffs for the Empire. Cattle and sheep are of the highest quality, and every care is taken to ship the meat in the best condition.

The New Zealand Frozen Meat Trade

Mr. A. S. Paterson (N.Z.), writes me : "The very interesting compilation which you published lately in *The Pastoral Review* is the most complete list of New Zealand freezing houses that has yet appeared, and is thoroughly up to date."

GLYNN WYE, NORTH CANTERBURY
The property of Messrs. R. O. and A. S. Duncan

"I have based upon it another compilation, bringing together the information it contained, and some other figures bearing on the trade, which, taken together, furnish a somewhat complete statistical view of it from this end, as regards its volume and the equipment for carrying it on. The compilation is appended. The export figures are taken from the valuable half-yearly card issued by the Shaw, Savill and Albion Company.

"The outstanding features shown are, first, the large

STUD ROMNEYS ON MOTUTARA, WEST COAST, AUCKLAND PROVINCE, NORTH PROVINCE, N.Z.

numbers of freezing houses scattered over the Dominion, being forty-one in all, when the eight under construction are finished—twenty-five being in the North Island, and sixteen in the South Island.

"The number and distribution of these works is such that scarcely any farmer in the Dominion can have a fat beast ready any day, or a thousand of them, without a freezing house fairly close by to take them off his hands immediately, and a steamer to carry them to London within a week or two. It comes wonderfully near to that ideal condition for the grazier—"not a blade of grass wasted." It is very remarkable

that so very far away from the centres of consumption, and for a perishable article, such a favourable position should have been attained by the New Zealand grazier, through means of the refrigerating process. Since the inception of that process, this favourable position has always been present in New Zealand, first latent as it were, and for the last thirty years gradually materialising with the advance of the country and the general progress of the frozen meat trade. It is based primarily upon one thing—the suitability of the country in soil and climate to grow English pasture grasses.

Group of Fat Bullocks, New Zealand

"The writer was once in the company of several men high up in English public life. The subject of New Zealand came up, and one of them asked abruptly: 'What is the chief among the resources of your country? Is it gold or timber, or what?' The writer replied promptly: 'It is English grass.' The looks that focussed upon him indicated both surprise and doubt of his mental condition. But he had a first-class opportunity to explain the singular adaptibility of the country to grow these pasture grasses, and produce just the class of meat wanted in England, and the excellent returns which the cultivation of these pastures yielded to the sheep

YARDS AND WOOL SHED ON A HAWKES BAY SHEEP STATION, NEW ZEALAND

farmer, as well as the leading share they had borne in the advancement of New Zealand.

"Well, these forty-one works have a 'killing capacity' of 130,300 sheep and 3590 cattle per day! How full a provision this is for the country's requirements will be understood when it is noted that were the full 'killing capacity' put in operation for anything distantly approaching to full time, say 250 days in the year, it would suffice to put through the killing rooms 32,575,000 sheep and lambs, and 897,500 cattle, or about one-

Stud Romneys on Motutara, West Coast, Auckland Province, North Island, N.Z.

third more of the former than there were sheep alive in the Dominion (24,830,328) in 1916, along with three-fourths of the number of cattle alive at the present time, outside the dairy herds of three-quarters of a million cows. Again, the storage space provided at the works is equal to 4,647,000 sheep of 60 lbs. each, or equal to about two-thirds of the year's export of sheep and lambs. These are fanciful ways of putting the matter, no doubt, but they give a striking idea of the vast equipment that has been provided for carrying on the trade.

"The position, then, is that the country is splendidly equipped with killing and freezing power and with storage

capacity. Nothing but a lucrative trade could have prompted all this rapid development. There may indeed be some suggestion on the face of the figures of the equipment being overdone. But it has to be remembered that a freezing house plant must be equal to the maximum daily demand upon it in the best of good seasons, or else it does not adequately serve the requirements of its district or its clientele. But such maximum call upon it only obtains for a more or less limited season when the grass is at its best, then the supply of stock gradually falls back to a fraction only of what the plant can deal with, but if a given freezing house is not equal to handling the stock naturally falling to it during the heaviest fattening season, the stock will find its way to some competing works. Put it another way, the supply of fat stock must be variable and uncertain, hence this surplus equipment for dealing with a maximum, and not only an average supply. Several times in the history of this business it has been doubted if the equipment had not grown too quickly and outstripped the requirements of the trade. But these doubts never lasted long. The wonderful ease with which the apparently surplus plant has quickly been overtaken again and again by the production has been surprising.

"One of the features of the trade almost from its inception has been the co-existence of two classes of freezing works, viz. farmers' works and proprietary works; the latter making a business of buying stock from the farmers, freezing the meat and manipulating the other products for the company's own account; while the basis in the former case has been that of freezing for farmers' account or for account of any buyer from the farmer, and the treating the by-products in a similar way. Such companies were projected and owned by farmers and their agents in the first instance. Time has modified their working, and many of these companies now also deal largely in stock for freezing, etc., on their own account. The proprietary companies also freeze for farmers' account when required, but it is a secondary feature of their business. As near as one can say, seventeen of the forty-one works may be reckoned as proprietary works, leaving twenty-four as farmers' works. The working of the double system gives most of the

HEREFORDS AT BUSHEY PARK, NEW ZEALAND.

farmers the choice of having their stock frozen for shipment on their own account to London, or selling the live-stock or the frozen carcases to one of the many buyers for English account. It is a healthy feature that all the ways of doing the business seem profitable. No one can say that farmers who have shipped to London on their own account have done better than those who have sold to proprietary works or to local buyers. But the trade goes on healthily and profitably

Whakatane Meat Works, New Zealand

to the satisfaction of all, while both the classes of companies have paid good dividends, and built up the fine plants largely out of profits.

"One can hardly refer to this subject without mentioning the splendid spirit of enterprise shown by the shipping companies engaged in the trade, in keeping up the refrigerated tonnage so well that scarcely ever before the war was a freezing house stopped working because there was not freight to carry the carcases. But since the war broke out there have been some delays in shipment, arising out of the commandeering

of the refrigerated ships by the Imperial authorities for other purposes. The freight dislocation has, however, been less than in many other trades.

"The prospects after the war are of the brightest. The good profits reaped by farmers from the war prices may be expected to stimulate settlement and increased cultivation of land. Just what the measure of this may be no one can tell, but no better stimulus to these operations could exist. It is generally recognised that the bringing into cultivation of more

Meat Works at Kaiapoi, New Zealand

land must in the North Island be very extensive for years to come, and that the South Island is also far from its limit of production in meat. Other markets than London will be competing for our meat. It is believed that America will want the quality of mutton and lamb which we can give them and which they can never get at home. And so the trade which has re-made New Zealand during the last thirty years may be expected to continue its great contribution to the country's prospects.

"It may be said that New Zealand differs from Australia in not having yet found other markets for meat than the United

Stud Romneys on Motutara, North Island, New Zealand.

Kingdom. There were great hopes of a trade with Canada a few years ago, but it only reached a volume equal to 80,000 sheep in its highest year—1913."

Sir Thomas Mackenzie, K.C.M.G., at a recent meeting of the British Cold Storage Association, said :—

"Refrigeration was the means of the development of the Overseas Dominions. What were the conditions prevailing before this industry was initiated ? Cattle and sheep were almost unsaleable. A leg of mutton could be bought for a shilling. Why, even a sheep was sold in his country (New Zealand) at from 6d. to 1/-. Boiling-down works were established for the mere purpose of extracting fat from the sheep, the rest of the carcase being wasted, and that at a time when meat was so urgently required in the great centres of population in this country. In Australia cattle—splendid bullocks—were sold at £2 per head. His friend, the late Mr. Christison, who had established the first works at Poole Island, Queensland, had told him that such was the case in that colony. In the 'History of the Frozen Meat Trade,' of which their Secretary (Mr. Raymond) was part author, there was a statement to the effect that eight hundred thousand sheep and seventy-three thousand cattle were boiled down for tallow, producing 110,000 tons, which were sold for £300,000. That worked out at 2/6 for each sheep, and less than £3 for each bullock. They could never too greatly honour the enterprising men who began the work in the Overseas, such as Brydone, Roberts, Cooke, Reid, Grigg, Davidson, and others. The first cargo of frozen meat from New Zealand was sent Home in the ship *Dunedin*, and the prices realised in London and Glasgow were 6½d. per lb. for mutton and 7½d. per lb. for lamb. Only one sheep in the whole cargo was condemned. At that time their flocks were, in round figures, 12,000,000, and it was thought by those who had studied the question that they could not bear a greater drain for exportation purposes than 300,000 per annum. Later on, Mr. Brydone foretold that it might be possible to export 4,000,000 carcases. What was the history of the development and its effects on our community ?

"New Zealand had exported nearly half the total number of sheep and lambs that had been brought into the British

market since the initiation of refrigeration. The total number of carcases exported to this country was 224,000,000. New Zealand had sent 107,000,000 of this number, Australia and the Argentine being responsible for the balance of 117,000,000. And what of the prosperity that had followed this ? In 1880 the population of New Zealand was less than half a million ; it was now 1,180,000. In 1880 lands in occupation amounted to 24,000 holdings ; there were now 80,000 holdings, comprising 42,000,000 acres in cultivation, and the capital value of the land was £389,000,000, as against £100,000,000 in 1880.

" It must not be concluded that all this work had been easily done. Its accomplishment required great enterprise, energy, knowledge and capital. Might he strike a personal note ? He was a shareholder in one of the earliest freezing companies, and in later years became the Minister of the Department (Agriculture) which had under its charge the supervision of all abattoirs in New Zealand, and the Inspectors who examined every animal before it was exported, seeing to its absolute healthiness, and attaching to every carcase a certificate that it was absolutely free from all disease."

The British Navy

A few particulars may be given here of what the British Navy did for New Zealand for four past seasons :—

Shipped 2,148,418 carcases of beef, lost 18,829 quarters ; 7,780,995 carcases mutton, lost 106,260 carcases ; 9,189,564 carcases lamb, lost 91,080 carcases ; 1,100,000 crates cheese, lost 63,000 crates.

Out of 570,000 bales of wool only 9,668 were lost during 1917 and 1918. This is a wonderful performance, and one the Navy may feel proud of. All such statistics should be printed for use in the schools of the British Empire.

ARGENTINA

THIS magnificent country lies within lat. 22 to 56 south ; its area is 1,139,979 square miles, and its population 8,500,000. It is bounded by Chile, Bolivia, Paraguay, Brazil, Uruguay and the Atlantic Ocean, and is at the present time the main exporter of frozen and chilled beef in the world. It is not likely that during the next quarter of a century any other country will rival it. Its most promising competitor is Brazil, which will have the advantage of a four days' shorter trip to the Home market ; but the Brazilians have a very long way to go to catch up their southern neighbour in the quality of their live-stock. The rise of the frozen meat export trade of Argentina reads like a romance, and it is given in detail in that excellent work by the late Mr. J. T. Critchell, and Joseph Raymond, London representatives of *The Pastoral Review*, "The History of the Frozen Meat Trade." As late as the eighties in the last century, Argentine cattle, of which there were vast herds, were poor and miserable, simply killed for their hides and dried beef. But directly refrigeration was perfected, the wealthy estancieros went to Britain and purchased the very best sires procurable ; money was no object, so long as they got the best, and this has gone on ever since. Although other countries get some excellent sires, the very best still go to Argentina, and still they pay the highest prices for what they take a fancy to. Shorthorns, Herefords, Angus, Devons and Lincoln Reds—representatives of all these types are in great demand. There is still abundant land both for breeding and fattening more cattle. As more land is laid down in alfalfa, so more cattle can be annually turned off young and of big weights for the freezing works. It is stated by one authority that not one-fifth of Argentina has yet been called into productivity, either for agriculture or cattle raising.

Vast areas between Bahia Blanca—the big seaport south of the river Plate—and the Straits of Magellan, are still available for cattle and sheep, and as their wonderful railway systems spread, these lands become stocked and of more value to the country. This is where private railways are so much more beneficial to a young country than hide-bound State-owned systems which keep a country comparatively stagnant. Again, there is ample room in the far west, in the northern territories, and even beyond their boundaries on the sub-pasture land of the Paraguayan Chaco, and in the great cattle country of Southern Brazil, to breed far more stock than at present exist.

West of Bahia Blanca, considerably beyond the termini of the railroads, in the foothills of the Andes, where there is plenty of water and good grazing all the year round—although the winters are quite severe at times—land may be rented from the Government at a very moderate rate indeed.

Cattle can also be purchased in that territory, in almost any desirable number, at a few pounds per head. It is the custom there to graze the cattle all the winter, and then in the spring to drive them, by easy stages, to the railroad centres, either east or north, although at times ranchers have taken them across the Andes for marketing at Valparaiso, Chile ; but, as a rule, the cattle are pastured on alfalfa lands in the province of Buenos Aires before being marketed.

Although, practically speaking, cattle raising can be carried on in any part of the Argentine Republic, there are regions which, for climatic and topographical reasons, are more favourable to the industry than others. Chief amongst such regions is the Pampa district, the climate of which is sufficiently mild to allow of breeding all the year round. Under the denomination of "Pampa" may be included the whole of the province of Buenos Aires, the greater part of Cordoba and Santa Fé, and parts of the adjacent provinces and territories, which constitute one immense natural plain, without any greater obstacle to the transit of stock than gradual slopes, small ridges, or, in some districts, woods of greater or lesser extent. The central portion of this region has been known for some years as the alfalfa zone. Alfalfa cultivation, however, has expanded to such an extent on every

HERD OF DURHAM CATILE AT CURUMALAN, ARGENTINA

side of this zone that to-day the designation records more accurately the district of its origin than the limits of its actual cultivation. The north of the province of Buenos Aires, owing to its situation on the banks of the Parana and the River Plate, and due to its having been settled longer than any other, is one of the most fertile regions imaginable. After having been for long devoted to sheep raising, it is to-day the principal centre of maize growing. The north-eastern portion of this

A Wealthy Argentine's Estancia
Mr. Hector Cobo's homestead at "La Armonia," Southern part of Buenos Aires Province.

province consists, generally speaking, of low-lying lands, subject to frequent inundations. The Provincial Government, however, has undertaken drainage works, the completion of which should have beneficial effect upon the value of these lands. The western district of the province of Buenos Aires, the south of Cordoba, and the province of Santa Fé, the eastern portion of San Luis and the Pampa Central, present very slight differences as regards climate and soil. The Argentine Mesopotamian provinces of Entre Rios and Corrientes likewise constitute an admirable cattle-raising region, due to favourable climate, abundant pasture, and ample water supply.

Lastly, Patagonia, cold and windy, is gradually attaining a position as one of the healthiest sheep-rearing districts of the world.

Argentina is divided into 14 provinces and 10 territories. It is largely composed of immensely rich plains with great depth of river deposit soil, and is almost bare of trees, except round the numerous estancias, where the owners invariably plant largely. In the Chaco will be found dense forest country. Cattle and sheep are to be found all over the Pampa, from the extreme north to the extreme south, where are the territories of Rio Negro, Chubut, and Santa Cruz. However, the bulk of the good cattle are to be found in the east, or Atlantic side, and sheep on the west and south. Patagonia is almost entirely devoted to sheep, nearly all of which are of the various British breeds, or crossbreds.

It is recorded that the first appearance of cattle on the River Plate was early in the sixteenth century, when seven cows and a bull were brought from Brazil, through Paraguay, by two Portuguese, the brothers Cipriano and Vicente Goes ; but soon after, large numbers were imported by Juan de Galazary Espinoza, treasurer to the Government. The first sheep were introduced in 1550, and large numbers of horses, cattle and sheep, in a semi-wild state, strayed down south to Argentina's rich pastures, from Peru and Brazil.

Roughly, Argentina may be divided into three divisions, and in each separate portion almost all the cattle of one class in the Republic are included. The principal herds of Durhams are held within the province of Buenos Aires, the southern half of the province of Cordoba, the southern portion of Santa Fé, the south-east corner of San Luis, and a small portion of the territory of Pampa Central.

Entre Rios and a part of the south of Corrientes holds the main breeding place for Herefords.

The outskirts of the country are chiefly devoted to Criollo and grade Criollos, these being cattle bred from the original Spanish importation of hundreds of years back, and afterwards allowed to become wild. Down south there are very few cattle, the country being chiefly devoted to sheep.

The Shorthorns are run on the alfalfa and on all the best of

the country, as owing to their early maturity they give the best results on the high-priced land, and they are very nice cattle indeed. The first impression one receives after being struck by the quality of the cattle is the number run on the area and the quiet nature of the stock.

Pasture.—The indigenous grasses of the Pampa region known as coarse grass have gradually been replaced in a radius of about 150 miles round Buenos Aires by the so-called soft grass, the seed of which was brought over by the Spanish in-

GROUP OF BREEDING MARES AT "EL SOCORRO," PROVINCE OF BUENOS AIRES

vaders amongst the forage for their horses. This grass, although actually of little agricultural value, was nevertheless superior to the Pampean grasses. Before the spread of alfalfa (the "Queen of the Pampa"), land was classified as of coarse grass and soft grass.

Estancias.—The year 1878 marked the beginning of a new era of extraordinary development in the Argentine estancias. In that year the Indians were finally subdued, and the settlement of an enormous tract of fertile territory became possible. High rents and heavy taxation induced many breeders to migrate from the inside camps to the cheaper and less crowded

lands thus opened up. In order to defray the cost of the campaign against the Indians, four thousand leagues of land had been sold by the Government, at the price of 400 gold dollars per square league. From 1878 to about 1890 was a period of transition, migration and settlement, no great progress being made in refining stock or in cultivation, or in increased value of land. The increasing areas placed under cultivation in the inside lands compelled all breeders, who did not own their land, to seek new pastures, with the result that from 1890 to the present day an amazing development has taken place. The native type of both sheep and cattle has almost entirely disappeared. The sires imported from Europe have completely transformed the herds and flocks of a few years ago, so that to-day the average Argentine estancia can compare favourably with any other similar establishment in the world. The immense industry opened up with the advent of the freezing companies, and the high standard exacted by the requirements of their European customers have done much to improve Argentine live-stock. The praiseworthy and eminently successful efforts of the Argentine Rural Society towards raising the standard of Argentine live-stock by means of cattle shows, prizes, publications, and propaganda, entitle them to the grateful recognition of the whole country.

Recently a friend, who was once manager of a big Australian station, wrote me from Argentina regarding their methods of working Argentine cattle, and his details were as follows :—

The paddocks are all small, about 1500 acres being a large paddock ; usually they contain between 400 and 500 acres. All classes of stock are kept separate, each age and class running in adjacent paddocks ; furthermore, all steers are graded, the most advanced being drafted from the others, the one object being to get them fit for market as early as possible. A buyer from a frigorifico would leave in disgust, without offering, if shown bullocks boxed up as is done in Queensland, and expected to offer for a percentage out of the herd. The steers being nicely graded, the buyer can examine each lot, and make his estimate to within a very narrow margin of of their killing weight. Steers are rarely held until four years old, the majority being disposed of between $2\frac{1}{2}$ and $3\frac{1}{2}$ years,

and no effort is spared to arrive at early maturity. In many instances the cows as they calve are drafted from the dry cows to give the calves a better chance, and again the cows with steer calves are drafted from those with heifer calves, and the former are given the best paddocks to help them along.

The steer calves are dehorned and castrated on most well-managed places within the first two months from birth. On some properties they are yarded to do this, but it is mostly

A Point of "Freezer" Stores ready for Transport, Argentina

done in the paddocks, the calves being caught with the lasso. Owing to the fact that almost all the properties have no other means of watering but troughs filled from wells, dehorning is of great benefit to the steers, as they do not knock each other about or take up much space at the trough while watering; furthermore, as almost always stock are trucked when passing from one property to another, if any considerable distance apart, or to market, the knocking about in the trucks is minimised. The frigorificos find that there is a very much larger percentage of bruised meat from a train-load of horned steers compared with those that have been dehorned.

Dehorning, though a cruel business if left until the cattle have attained a considerable growth of horn, is quite a light operation if done while the calf is young. The most popular method seems to be to cut out the button with a half or three-quarter inch gouge and rub on a little stick caustic. When the beast has a large horn, several varieties of dehorning implements are in vogue, including a saw, all more or less barbarous in use and effect.

1. Champion Shorthorn Bull, Quilmes Collynie 5th, 3 years old. Owned by Sr. Leonardo Pereyra, San Juan. Won Shorthorn Society's Cup, MacLennan Cup, and Amos Cruickshank Cup (Group of 5). Sold for £2187.

The Herefords of Entre Rios are run on poorer quality land, or land which is more suitable for them, owing to their hardy nature and resistance to disease. The paddocks on these properties for the most part are larger than on the better country, otherwise the Herefords are treated much the same as Shorthorns, with the exception that dehorning is not so generally practised. Entre Rios, as its name implies, has many streams, consequently dehorning is not necessary to prevent knocking about while watering, as on alfalfa camps.

Branding is generally done in the yard in much the same way as it is done in Australia, but rather more roughly and more slowly.

Cattle drafting in the yard is done through a race, similar to an Australian sheep race on a large scale, the men working the cattle on horseback in the yard, the only footmen being the drafter at the gate and a man or two on the platform outside the race keeping the cattle running.

2. Champion Shorthorn Cow, Ascott Valentine, 4 years old. Owned by Sr. Pedro T. Pages, La Josephina. Won the A. de Barry and Co. Cup, and Family Group Prize (with two calves).

No stock-whips are used with the cattle, but each man has a short-handled riding whip with a lash of raw greenhide about 1 ft. long and 1½ in. wide, with which he gives the cattle a flip when opportunity occurs. Apart from this, the cattle are handled very noisily and roughly. They are knocked about a lot by being driven too fast, droving as used to be known in Australia being unknown in this country. One notion that exists is that if cattle are given a gallop occasionally once or twice a week, that is, chased round until they are

red-hot, they put on condition more quickly. Many Englishmen managing there have adopted that notion also. Its effect on a lot of soft steers feeding on green juicy alfalfa may be imagined, but the cattle do not suffer from it as much as one would expect, partly because they are accustomed to being driven very fast, and it does not make them restless. When he has cattle to drive, the average estancia peon, as the stockman is called, is in a great hurry apparently, but that is the only time, for he is a leisurely customer as a general rule.

Inoculating or vaccinating for the numerous diseases gives a considerable amount of work. Vaccination against mancha (black leg) in calves is done almost everywhere at branding time, and there are numerous other diseases to guard against; consequently the appliances for this class of work are very complete on every up-to-date place, including dips for dipping scabby cattle and those from tick-infested districts.

The preparation of stock for shows has also attained great perfection. All steers are stall-fed and haltered, and as none of them are more than four years old at the most, they are forced very extensively. The prizes are usually for classes, according to age, from twelve months upwards. In the preparation of the younger stock, calves are forced from two months old, steers of ten and eleven months sometimes getting the milk from three or four cows, in addition to all kinds of artificial foods.

The criollo cattle run on the poor camps to the west and north. Perhaps they may be said to be hardy, as they can certainly live in lower condition for a long time than any other breed of cattle, but they are very difficult to put condition on, no matter how good the feed; nor do they ever carry a great quantity of flesh, though they are nice meat when fat, not hard and tough like the native cattle of South Africa. They are great walkers, and can walk as fast as an ordinary horse; it is no uncommon feat for a mob of these cattle to be driven 150 miles in three days. As is to be expected, they are ill-shapen animals, never attain much weight, are of all colours, and with a great growth of horn. Latterly, they have been in great demand for canning purposes, as the flesh has

very little fat. These cattle are chiefly run on unimproved camps, and are very roughly treated in every way.

Beef-making in Argentina is almost exclusively a grazing business, but it is no longer on the open range basis (says Mr. C. F. Curtis in *The Breeders' Gazette*, Chicago). "It is more of a farm pasture business, but the pastures are very large. Few of the cattle seen at the packing plants have ever tasted grain. The greater part of the cattle as they come to

3. Champion Hereford Bull, Cameronian 27th, 3 years old. Owned by Sr. Celedonio Peredo, Villa Maria. Won the Hereford Breeders' Cup, Conjunto Prize (with two others), Leonardo Pereyra Cup, Cipriano J. Quesada Cup, Hereford Herd Book Society's Cup, and Nicanor Olivera Cup.

market are of uniform quality, showing good breeding, and carrying plenty of flesh for good export beef. They show better breeding than either the farm cattle or the range stock of any other country that is producing beef on a large scale. Most of the cattle from the large estancias are bought direct by the packers or frigorificos, as they are called. A representative of the packing-house visits the estancias, inspects the saleable stock, and reports to his firm on the number of animals, condition, and feed, and sends an estimate of the average

number of pounds of dressed beef per bullock. The cattle are bought on the basis of this estimate. The frigorifico managers deal frankly with the estancia owner, and tell him just how much beef his cattle made. The same buyer sticks to the one estancia for a lifetime."

Shorthorns

Shorthorns have been found ideal for most conditions existing in Argentina. The proportions of cattle that have been improved by grading are 75 per cent Shorthorns, 15 per cent Herefords, and still fewer Angus. Of registered Shorthorns, between 75,000 and 80,000 pedigrees have been inscribed in their herd-book. Many breeders are not registering their inferior pedigree animals, placing such in their grade herds and using them only for commercial purposes, so that many collections of Shorthorns are to be seen that are pure-bred or showing a predominance of characteristics of the breed where the quality is of high order. The leading live-stock exhibition is the show held annually in August by the Argentine Rural Society at Palermo, a beautiful park in Buenos Aires. The stabling is the most elaborate to be seen at any show in the world. The judging is done during two days prior to the inauguration programme. The Shorthorn cattle classes are the principal features of the Show, and there is no other breed that compares with the Shorthorn in number of entries and the average high quality.

The auction is really the main feature of the Palermo exhibition, as the greater portion of the entries of all breeds of live-stock are disposed of at that time. The sales usually consume a fortnight. It is a splendid sight to see classes of Shorthorn bulls, well filled from first to last, and numbering up to 160 in a class. One bull, New Year's Gift, champion at Palermo recently, brought at auction £5520, and the result was nicely symbolised in the comments of the Scotch judge, Mr. Law, who remarked : " A guid bull, but a grand price. I would no mind taking a dozen like him back to Scotland."

Tierra del Fuego and Southern Patagonia

(By a Correspondent to *The Pastoral Review*)

"In comparing the Argentine with other countries, one fact is often overlooked, viz. the number of miles that lie between the 23rd and 55th degrees of latitude, or, in plain words, the extraordinary range of climate, equalled, I believe, by no single country in the world between its northern and southern

4. Hereford Cow, Plum 25th, 2 years old. Owned by Messrs. C. E. and B. Duggan, Santa Sabina. Won the P. and G. Hughes' Cup.

boundaries. From the mountains of Bolivia to the glaciers of the Beagle Channel, the land falls in a sweep of over 2000 miles with an average width of only 500 miles. Thus, by nature of its formation, the country is assured against a total loss of its products in any one year. It would be more than a coincidence if the sugar and hardwoods of the north, the linseed, wheat, and alfalfa lands that support the immense herds at the centre, the mineral and wine industry of the Cordillera, and the pastoral wealth of the south should simultaneously fall on bad times. This explains the conflicting accounts

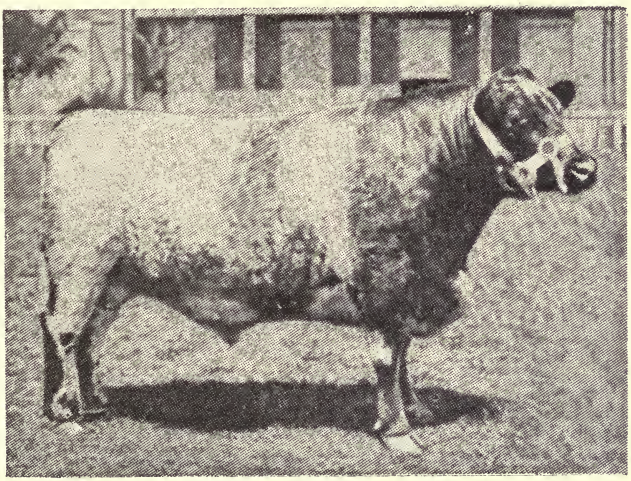
brought back by different settlers, and also in a measure reveals the secret of Argentina's steady advance.

"The Argentine constitution provides for certain provinces, which are distinct from the so-called territories. The former are supposed to be self-governing. They have the full right of internal management and a legislative body of their own. The territories are under the direct control of the central National Government, which appoints to them their military governors and civil judges. For this additional reason it is difficult to generalise concerning Argentina.

"The first settlers of modern times came to Patagonia from the Falkland Islands. These outlying specks of a former continent, luckily for the Republic, form part of the British Empire, else to-day the plains of Patagonia might have remained as in the time of Darwin, peopled but by vast herds of guanaco and the scattered tents of some roving Indians. The islands are pre-eminently adapted for the breeding of sheep, and it is calculated that at the present time over 2,000,000 head graze on the short, wind-swept pastures. Eighteen years ago the British Government stopped the sale of fiscal lands. This, combined with the large profits that the well-stocked farms had been yielding, induced certain pioneers to try their luck on the reputed barren mainland of Magellan. The shipment of the first flocks over the 300 odd miles that separate the island from the treacherous coast, was attended with great risk and loss, but the result amply justified the bold venture. In 1882 the lands now occupied by the Patagonian Sheep-farming Company were grazed by only 18,000 sheep. These same lands now support within the boundary fences close on 300,000 head. This total has been arrived at with no further purchase of stock than those necessary to bring in fresh blood, and in spite of severe winter losses.

"The first stations were planted close to the entrance of the Straits, and land was rapidly taken up along the first and second Narrows. These necks of the sea are but 2 to 4 miles broad, so it is not surprising, after the five years necessary to get the new stations into working order had passed, to find sheep being shipped over to the fertile shores of the "Tierra Del," as it is dubbed with true Anglo-Saxon brevity. The

pastures here are superior to those of the Patagonian coast, on account of the unfailing streams of crystal water that traverse the land in every direction. The climate, moreover, presents fewer extremes, and protection is afforded from the bitter south-west winds by the high ranges of mountains at the back of the open ground. It was doubtless the aspect of these same ranges, viewed by the sea captains cruising along their southern shores that pictured Tierra del Fuego as a mass of ice-clad



First Prize Fat Shorthorn Bullock, Argentina
Live Weight, 2112 lbs. Dead Weight, 1519 lbs. Sold for £393 to Freezing Co.

peaks, inhabited only by the bloodthirsty savages that sat perched upon them, anxiously scanning the beach for ship-wrecked crews.

"The commercial capital of all these southern territories is Sandy Point, a town which boasts some 7000 inhabitants, and is situated about 50 miles west of the second Narrows. Of Tierra del Fuego Argentina owns but a small area, the ground lying east of a line dropped due south from Cape Virgens to the Beagle Channel. Ushuaia, the Argentine capital here, as well as the town of Gallegos, on the Patagonian southern coast, is entirely dependent on Sandy Point for their trade.

"The better camps in Tierra del Fuego will support about 5000 sheep to the square league (9 square miles), and have been sold at public auction as high as £1000 per league. There are possibly some 1000 miles in the island fit for grazing, of which much is yet fiscal land. This will doubtless be taken up as the country opens out and a definite settlement is made with regard to the Indian question.

"Half-way up the Patagonian coast is a deep indent bearing the name of the Gulf of San Jeorge. The 46th parallel of latitude, piercing its centre, runs across a high barren tableland, to where Lake Buenos Aires, one of the largest of the newly discovered Andean chain, shows its 70 miles of sparkling blue among the foothills of the Cordillera. This line marks a distinct zone, the land to the south being exposed to colder winds and having a heavier rainfall than that to the north. From Cape Virgens another line, drawn in somewhat irregular fashion to where the Pacific has pierced the Andes at Last Hope Inlet (site of the famous Mylodon Cave), gives the Chilean boundary to the south. Between these two boundaries is the territory known as Santa Cruz, the most extensive of all the national territories, as it is also the least settled, with an area of 10,159 square miles and a total population of about 2000 persons.

"Between Rio Gallegos, the first river flowing into the Atlantic north of the Straits, and Sandy Point, lie what are reputed some of the best sheep camps at Patagonia. In a country so little known and of such great extent as that comprised under this title, it is as well to receive such a statement with caution, though it may well be that owing to longer settlement their possibilities have been more thoroughly exploited than those of remoter districts.

"The lands on the coast are generally accounted the most valuable, as the climate is tempered by the sea breeze, while economy in freighting has also to be considered.

"The alluvial soil on the surface reaches a scant 6 in., and overlies a foot of stiff boulder clay. Below this come the endless beds of marl, sand, and gravel, which have caused the well-known tablelands to be the subject of so much puzzled controversy in learned circles.

UNIV. OF CALIFORNIA

"The first sheep brought to the mainland by the Falklanders were hardy Shropshires, with a strong infusion of Merino, a type that was speedily modified, before the settlers stretched the seemingly limitless plains. The problem given them was to convert their grasses in the shortest possible time into mutton and wool. To this end larger breeds were introduced, principally Lincoln and Romney Marsh, and it is from this last-named strain that the majority of Patagonian wools are clipped to-day.

Sheep in Patagonia

"On these higher pampas of the tablelands the soil is worn perilously thin, small patches of grass alternating with a surface of pure gravel and useless scrub, and Nature's warm provision of wool grew coarse and luxuriant in the teeth of the blustering winds that swept across them. The newer breeds of sheep imported by the settlers strode joyfully patch to patch, picking out the softer grasses, and from one long-legged generation to another they waxed fat and kicked.

"The farmers of Southern Patagonia and Tierra del Fuego are mostly hardy Scotch, practical Englishmen, or New Zealanders, as, by the way, are most of their shepherds and hands. The Argentine and Chilean peon have given but poor

results in the south, and a traveller may ride from Santa Cruz to Sandy Point and hear no word but English, with, perhaps, a slight smattering of German. As a consequence, business is conducted on the uncompromising basis of pounds, shillings, and pence, the national paper-money being solely a medium of exchange. The keynote of life in Argentina's farthest south is independence, not to say isolation. It is a rawly new country, even its very formation is geologically unfinished, and it is too big for any man to interfere with his neighbour, to fight him or to help him. The settler is launched upon the dreary leagues with his flock of sheep, his horse, and his faithful dogs. Whether he be man enough to win out will depend here, more perhaps than in any other civilised land, upon himself alone.

"If the question were suddenly put to them, 'What sort of a country is Argentina?' ninety-nine out of a hundred men would reply that it was a level, treeless plain, adding as an afterthought that it extends half-way up the ridge of the Andes, separating it from Chile. But in reality four-fifths of the big Republic is covered by (1) high mountains and their broken foothills; (2) abrupt tablelands; (3) scrub and forest. The remaining 20 per cent is the true pampa.

"The mistake is, after all, but a natural one, for up to thirty years ago the pampas of the Plate coast comprised all that the settler of that day knew, or cared to know, concerning the country. He had pitched his camp as near to Buenos Aires as possible, having an eye to cheap freights and a good rainfall, while at the same time he kept in touch with the political and trading capital. We must not lose sight of the fact that forty years ago the Indian camps were pitched within fifty miles of the town. Whilst these gentry were being driven back, the hard grass on his farm gave way to soft meadows, and as their stocking capacity increased, so did his yearly balance-sheet show a better return. The land behind him to the west was dry and sandy, and to have refined its coarse grasses by the simple process of grazing would have occupied many a weary and wasted year. So our pioneer stuck to the coast, and when they spoke to him of the 'outside camps,' he shook his head, and said he was all right where he was.

Cattle Dip on an Argentine Estancia

UNIV. OF
CALIFORNIA

" What is the pampa was in former ages covered by a body of water, now commonly known as the Pampean Sea. The flood stretched up to and round the Cordoba range standing in the middle of the Republic ; in the south it reached to the tablelands of Patagonia; north to where the slopes of the Cordillera incline to the watershed of the Parana. The formation of the plain marks the different currents that directed the receding waters. We find sand collected by erosion of the mountain chains ; vegetable silt carried down by torrential rivers from a tropic interior, mixed with the fossil deposits of a former ocean bed. The general upheaval caused the waters to retire gradually from the neighbourhood of the Andes, the outlet of those subterranean forces which are still continuing their gigantic work, albeit in a more deliberate and less marked degree.

" If we examine the surface of the land we shall find that although in certain tracts lying between the Cordova and the Andes the sandy formation resembles that of the central pampas, yet it conceals rounded foothills of barren stone, which make stream and reservoir irrigation the only solution of the water question. Wherever we go north to higher ground we find a forest which, from its stunted outposts on the sandy plains, closes and thickens to the impenetrable groves of the Argentine Chaco. Again, skirting down the coast from the broad delta to the Parana, we find that the porous sand has been mixed with, and overlaid by, an increasing thickness of alluvial, packed by the rains to a grazing ground of almost unparalleled richness. So none of these are the lands for which we seek.

" Take now a rough line 200 miles long between the cities of Cordoba and Rosario. Drop further a 400-mile perpendicular from Rosario due south towards Bahia Blanca, leaving outside it all the rounded coastline of the Queen province. Complete the figure by a southern boundary that roughly parallels the Rio Colorado, and on the west skirts the detached spurs of the ancient Cordoba range. We have now 80,000 square miles, or, roughly, 10,000 square leagues of the true central pampas, the ' outside camps ' of the coast belt. Our parallelogram is not a very exact one. We must bulge it here,

and cut off a corner there ; for in the Argentina they are not used to be bounded by straight rules, geometrical or otherwise. But if the surface shades from a 6-in. alluvial to a faintly tinged sand ; if the subsoil to 100 yards depth is a sandy marl mixed with lumps of freelime that soak up the uncertain streams venturing from the hills before they can catch sight of the low-lying coast ; if the rainfall is between 20 and 25 in. ; if as close as 6 ft., and not more than 40 ft., below the roots of the wiry pampa grass the water comes in strata, brackish, and in some parts undrinkably bitter by reason of the lime-impregnated soil through which it has filtered ; if, finally, there is no rock, nor pebble, nor any vestige of the stone age larger than a grain of sand—by all these tokens we may know that we are in the true alfalfa land.

" Twenty-five years ago alfalfa was only grown on the more progressive estancias, and even then in paddocks rarely exceeding 10 to 20 acres. The crop was set aside for imported stock, and for the benefit of such home-grown animals as were deemed good enough to send up to the annual sales at the capital. It was stated that grazing killed out the plant, and, in view of the high cost of establishing it, estancieros wasted year after year in cropping a worn-out and unprofitable patch. The necessity of finding a drought-resisting forage in the warmer, sandier backblocks, where the summer rainfall was too scanty to keep up tender grasses, induced a more enlightened farmer to give the plant a trial. From the result of that successful experiment we may date the opening up of the central pampas.

" These plains in the natural state will support on their sunburnt tufts of grass a maximum of 500 head of cattle or 2000 sheep per square league (6400 acres). The same ground laid down in four or five paddocks of alfalfa will maintain all the year round, and turn off in good shape 2000 head of cattle, in addition to 5000 sheep. That is to say, the introduction of this unequalled forage plant has raised the possible production of these pampas from 5,000,000 cattle, or 20,000,000 sheep, to 20,000,000 cattle and 100,000,000 sheep—an increase of 800 per cent.

" The yield of an acre of alfalfa if cropped may be safely

placed at two tons of hay, or 20 tons of ensilage, per annum. The process of making ensilage is as yet very little practised in Argentina in spite of the excellent results it yields. Large fields cut for hay, which might be utilised in this manner, are left to rot owing to an unexpected shower. If the two operations were carried on side by side, it is safe to say that the summer yield of two tons would be augmented by at least five tons ensilage per acre. The total yield for one league (which does not by any means represent the maximum yield in a good season) then becomes 12,000 tons hay and 30,000 tons ensilage per square league. There is left a sufficiency of short feed to support two sheep to the acre during the six remaining winter months.

"The foregoing figures will give an idea of the growth of green stuff that a bountiful Nature puts at the disposal of the farmer in this region in an average year. Of the most approved methods of converting this food supply into mutton, wool, and beef, I have no space to treat. Local conditions and a consideration of individual ways and means must always be set before any 'counsel of perfection.' I only give it here to show what are the capabilities of the alfalfa region if competition should ever drive the easygoing estanciero of to-day to the more intensive farming practised in less favoured parts of the globe.

"I give a rough summary of the chief points to be regarded in the establishment of an alfalfa estancia :—

"1. The plant should, if possible, be laid down in a district which will ensure the owner a return on his money while the ground is being broken up, i.e. he should not settle too far outside. On the camps, within a day's carting of a station, his only indispensable outlay will be that of fencing and alfalfa seed, which is at once returned to him in the increased value of his property.

"2. If grazed with judgment, the plant will last indefinitely. I have seen paddocks that were over fifty years old. Disking will often renew an apparently worn-out paddock.

"3. As the habit of the plant is to renew its sprouts directly through the crown, it will die out if continually grazed during its growing season by close-feeding stock, such as sheep. In

this case the land will still have been greatly benefited. At a distance of 5 ft. below the surface of a five-year-old alfalfa patch there are in the space of one square foot from ten to thirty roots reaching directly to the surface, and averaging one-eighth of an inch in diameter. In addition to this thorough subsoiling, large quantities of ash and free nitrogen, which the plant has the property of storing near the surface, go far to ensure a successful after-crop of cereals. It is probable that in many cases a five or seven years' ley of this kind would be more profitable to the farmer than the policy of nursing his paddocks.

" 4. After the land is laid down to alfalfa, the surface strata of water will drop from 4 ft. to 10 ft. below its original height in the wells, owing to the demands made on it by the penetrating roots. This fact will go far to reclaim low-lying and mosquito-infested grounds. The water will tend to improve as more alfalfa is laid down, for the dense growth of the plant checks the evaporation of the rainfall.

" 5. The seed should be as clean as possible, and grown in the neighbourhood, in order that it may be well acclimatised. It is more important, and much more economical, to work the ground thoroughly at the time of sowing the seed than to sow a heavier quantity of seed in badly prepared ground. During its first season the alfalfa should be lightly stocked, and, if possible, mown.

" I have met with more prosperity, and found the country opening up faster, in the alfalfa district than in any other throughout Argentina. Yet it must not be supposed that estancia business here is devoid of drawbacks. Chief of these in many parts, and especially throughout the southern parts of Cordoba, is the question of water supply, which, though abundant, is often so undrinkably bitter that it will not be approached even by the cattle. Where this is the case, it is the custom to make wide, shallow wells, which to some extent catch the surface drainage. Again, the wind that blows incessantly all and every day, save for a short breathing space in early winter, brings with it an invariable accompaniment of dust, flies, and discomfort, which constitutes a very serious factor in home life on a small ranch. The planting of trees

and turf will afford a partial relief, but these nuisances will continue, in a more or less degree, as long as the pampa remains pampa.

" Animals are liable to loss from bloat if fed carelessly on the rank growth during springtime, and their meat is pronounced by butchers to be less attractive than that of stock fattened on natural grass pastures. Furthermore, unless money has been freely invested in storing the summer growth, an estanciero may find himself in a very serious quandary at the first touch of winter. Standing feed that would have supported 1000 head of cattle will barely suffice for 200 after a few nights' hard frost. The stock must be smartly handled during the summer season in order to take advantage of the paddocks at their point of maximum nutrition, i.e. just before the flowering stage of the plant, and when it is eaten bare the stock should be taken off at once in order to allow the plant to sprout again in the shortest possible time. A natural corollary to this rule is that it is impossible to have too many paddocks on an alfalfa farm, and fencing means a heavy outlay on an item which is constantly deteriorating in value. If the home stock is not sufficient to eat down the summer growth, it should be cut at once, or fresh stock purchased, for in a fortnight more the standing crop will have lost 40 per cent of its feeding value, and in another month it will have altogether vanished, leaving no profit, and retarding the growth of its successor. The estanciero must, therefore, reserve at least 30 per cent of the capital at his disposal for emergencies, which are certain to arise at the shortest notice, and which will only admit of a ready-money solution. It is this reserve fund which will probably make the difference between handsome profits and none at all.

" Previous remarks will have made it clear that in the region of which we have been treating agriculture is dependent for its ultimate success on the planting and cultivation of alfalfa. Cereal crops, however, form a large proportion of the annual product and wealth of the district.

The Argentine Mesopotamia

"The watershed of the River Plate basin is collected from three sources, to wit :—

"(1) The Cordillera of the Andes, which from latitude 25 deg. in N.W. Argentina rapidly widens to its maximum at the Bolivian 'massif' in latitude 15 deg., where it almost touches ; (2) the central highlands of Brazil, dividing the Amazon and the River Plate systems ; and, finally, (3) the coast range of Brazil, which starts between the towns of Bahia and Rio de Janeiro, also in the latitude 15 deg., and terminates in the rounded foothills of Uruguay.

"The Brazilian highlands, as they lie sprawling over the centre of the South American map, may be likened to an ill-formed kite. The head, pointing to the Amazon, is fringed by the affluents of that inland sea. The lower sides are stiffened by mountain ranges, that acquire the occasional dignity of 5000 ft. As the tail of the kite, some 600 miles long, passes southward through Paraguay, this height drops steadily to 1000 ft. At this altitude the range halts finally on the northern boundary of Argentina, overlooking the network of swamps and lazy streams that gives its name to the province of Corrientes.

"In the wide valley between the Andes and the western slopes of this range flows the river Paraguay. Between the east of the same and the hills of the Atlantic coast lies the course of the Parana. Not the plain Parana of the south, but known here in its upper channels as the Paranahyba, or, more generally and simply, the 'Alto Parana.'

"It would have greatly simplified the geography of all this watershed if the Parana had been able to keep to the eastern side on which it originally started. It would then have entered the Plate estuary by the present bed of the Uruguay, which would in its turn have figured simply as one of the tributaries entering the great river from the Brazilian coast range. But just north of the spot where their junction would have taken place, a spur of hills juts out, forming a right angle, and almost joining up with the Paraguayan highlands—the tail of the kite. Now, in its hurried upper course, the Parana

has carved for itself a deep bed in the soft, red sandstone. But here, in the south, its banks have broadened, and it has lost much of its old impetuosity. It cannot, as in the far-off falls of Guayra, burst its way through the obstacle to pour in a straight flood ever southwards. So at the south-east corner of Paraguay it is forced to swerve sharply to the west, making a 200-mile boundary for the north of Corrientes. Some 100 miles past the bend the river crosses the last vestige of the hills in a short rapid at Itati (the ' many rocks '), which prohibit navigation on the Alto Parana for all vessels drawing more than $3\frac{1}{2}$ ft. of water.

" The Paraguay basin has a character entirely distinct from that of its rival. It runs for the greater part in a path reconquered from the ocean rather than a bed carved out by running stream. At its headquarters, the lonely lagoon-morass of Xarayes, over 2000 miles from the bustling Argentine capital, its height is calculated at only 700 ft. above sea-level. In time of flood both the main stream and its tributaries overflow their low-lying banks to the extent of many hundreds of square miles. Of all these tributaries the greatest now advances on it. Just above Corrientes the Alto Parana merges in, and swallows up the Paraguay in spite of its reinforcement by the Bermejo, whose mouth is clearly visible from the town. Then, assuming the right-of-way, it turns once more to the south, and enters the Plate as the Parana proper (' the Mother of the Ocean '). So it has come about that the Paraguay has lost its pride of place as one of the world's greatest waterways, whilst the Uruguay rises into sudden importance as it takes up the abandoned eastern route. When we read that the Plate is formed by the junction of the Parana and the Uruguay, the statement is true in fact, but not in proportion. The latter river can boast in all of but a thousand miles of length, whilst the totals of the Paraguay and the Parana together sum over 4000 miles. A better idea would be given if we read : ' The River Plate is represented in South America by Parana and Co.'

" It has been necessary to dwell thus far on the vagaries of the Parana system, inasmuch as they set a straight boundary round the Mesopotamia, clearly defining the lines upon which its future development must be laid. Its eastern boundary,

the River Uruguay, has an average width of one mile. Three hundred miles from its mouth we find it broken in a series of long, lagoon-like stretches, whose waters pour down in alternating rapids, and render serious navigation impracticable. Briefly, above the town of Concordia, where the first serious barrage occurs, the Uruguay is a glorified trout stream. On the northern and western limit we overlook the Parana, not, as in its higher reaches, a deep, swift river, but a degenerate Parana—a stream whose width may be three or thirty miles, according to the caprices of its sudden floods, beyond the scope of modern engineering to bridge, and puzzling, with its shallow channels and shifting islands, the most experienced of river pilots. To the south lies the Plate estuary, leading to the ocean.

"The Mesopotamia which is bounded by these rivers is really a peninsula, whose neck in the N.E. corner is the territory of Misiones, the ancient stronghold of the Jesuit power in the Southern Americas. On this side the red sandstone hills fringing on Corrientes have as yet resisted the encroachment of the tropic forest, which commences a few miles further north. Here is the road by which the cattle from the uplands of Brazil find their way to the south—a highway whose importance will be increasingly felt as trade relations between the two countries are drawn closer.

"There is little doubt that at a former period the ocean extended far further into the interior, when the continental waters discharged at what is now the junction of the Alto Parana, the Paraguay, and the Bermejo. From this spot southwards the land rises. Corrientes is gently undulating and traversed by numerous streams that wander confusedly through marshy bottoms. Entre Rios, set upon the bar of that ancient watershed, rises in ridges of an argillaceous formation, running nearly due north and south. Both provinces are covered with a rich cap of modern alluvium, save for a strip along the banks of the Uruguay, where the red foothills come down as far as the bar of Concordia, before mentioned.

"Although it is only the north of Corrientes that crosses the line of the tropics, life in this province frankly crosses the semi-tropical stage. This is due to its low general altitude,

combined with the near presence of large bodies of fresh water, which convert it during the summer months into a gigantic forcing house. The climate at this season is one of enervating humidity. Maize, sweet potatoes, bananas, and mandioca solve the easy problem of existence for a shiftless lower class. Those who have higher ambitions may undertake the cultivation of a tobacco patch, selling a poor quality product at equivalent prices. Orange groves are numerous; the difficulty lies in procuring suitable labour to harvest and convey the golden fruit to market. Peanuts will produce abundantly, and the crop is readily bought up by the various oil mills established on the banks of the Parana.

"The real Corrientes industry (the word is somewhat misleading) is stock-raising, and that of a most primitive kind. Sheep are relegated to a second place. The dependence of the estanciero is on his cattle—the red-coloured, long-horned kind, that have become as famous as their brothers of early Texas, and meet with as little favour in the eyes of the city butcher. They have won their place on the principle of the survival of the fittest, for they live and flourish in places where orthodox breeds die of redwater, Texas fever, and similar weaknesses. They may be taken on forced marches through drought-stricken regions, and their skeletons will still survive. They can wander belly-deep into the great leechy morasses, and browse contentedly on the floating water-grass. Herdsmen freely admit that their bloated appearance after such a diet is not the sign of a firm fatness, but hitherto that has been deemed of but little moment. For at the long last the merit of the Correntino cattle lies in their numbers; they are found on the savannahs of Paraguay, on the uplands of Brazil and Rio Grande. From all points they converge to where, on the lower reaches of the big rivers, the factories (over a dozen in number) lie in wait for them. In Southern Entre Rios, across the river in the 'Banda Oriental'—to give to the Republic of Uruguay its old Portuguese title—wherever the carcases are there the saladeros are gathered together. In them the steers are chopped into jerked meat for Brazil and Cuba, discriminated into Paysandu tongues, or boiled down to reappear later as Bovril and Liebig's Extract on the dining-tables of effete

Europeans. The export freezing trade of the Plate does not touch this class of stock; it is the roughage of the Republic, and prices rule accordingly. From 10 dollars to 15 dollars gold is the common quotation for fat steers or cows. The number of animals treated by the Entre Rios factories is very large, while the total that vanishes by way of the Mesopotamia every year into the choppers' yards and the melting pots is over half a million.

"From the extreme N.E. corner stretching towards the centre of the Entreriano Peninsula lies one of the unknown and wholly unexplored portions of the Argentine Republic. The great lagoon of 'shining waters,' the 'Ubera,' lays under tribute directly or indirectly some 2000 square miles of land, although the source of the rivers Corrientes and Merinay, its level seldom alters, nor is it sensibly affected by prolonged droughts. Its neighbourhood is heralded by an endless succession of 'tacurus' (red ant heaps), which stand from 3 to 6 ft. above the ground, or water, as the case may be. When dry, the whole landscape much resembles a gigantic Chinese graveyard, while the holes under these heaps are the refuge of innumerable snakes. On the edge of the permanent water grows a high, almost impenetrable, fringe of rushes. In the inner lake the fecundity of aquatic growth under a tropical sun has led to the formation of islands, that change their shape and station as the capricious winds and floods direct. These floating 'terra firma' harbour, amongst other inmates, the gigantic anaconda, a water-snake, that attains over 20 ft. in length, and in girth the thickness of a man's body. Here it lies, as the natives firmly believe, waiting to devour the hapless gaucho, horse, and all, who shall wander lost in the marshy labyrinths.

"It is easy from our seat in the railway car (but a few years ago on its first journey through the province) to wave aside such idle tales with the smoke of an after-dinner cigar, but the half-Indian peasant of Corrientes is but a step removed from the serf of the Spanish occupation. Modern sophistry will leave him unconvinced until modern engineering drains the fertile basin, and his superstitions vanish with the miasma of the rush-grown swamps.

"Of the two provinces, that more favoured, both by its own resources and by reason of its unique position on the Plate, is undoubtedly Entre Rios. Its rolling lands are composed of a stiff, black alluvium, overlying a subsoil well adapted to the planting of trees. There is little trace here of the sand which makes it so easy for the farmer to break up the flat pampas of Buenos Aires. The limestone deposits near the town of Parana, previous to the discovery of the quarries of Cordoba, set up kilns which supplied the whole Republic. About one-third of the country is covered with open belts of hardwood, in which the Nandubay predominates. This tree grows in the likeness of those straight-stalked, bunch-headed parodies that are palmed off on confiding childhood in Noah's arks—a design which Providence has manifestly created for the purpose of fence-posts. As the land has no companion hills from which to tap its water supply, surface springs are rare, but between the rolling downs run frequent watercourses. Banking these gullies to catch the surface drainage is the commonest and easiest system of providing water to the stock, but it is a broken reed in time of drought, and much of the mortality during recent years can be traced to this cause. Well-water may be found at depths varying from 10 to 50 yards, according to locality.

"The near outlet of the province to the sea-board, its dower of fair pastures, and its equable climate, have marked it from the earliest days of Spanish occupation as a desirable possession; yet this very fact has retarded its advance. Happy is the country without a history. Throughout the turbulent growth of the young Republic Entre Rios has been a hotbed of political unrest—the chosen stumping ground of revolutionists. It was by way of the Mesopotamia that troops were led to fight Brazil in the early twenties, and Paraguay in the seventies, of last century; it was across this province that the irrepressible patriots marched who struck for the independence of Uruguay, and it is here that discontented refugees from that small adjoining State have ever found sympathy and a safe refuge. Here it was finally that General Urquiza upheld throughout a whole decade the standard of revolt that led to the overthrow of the dictator Rosas, after the latter had ruled

the land with blood and iron for over twenty years. And these have been but the main episodes in the drama.

"In Entre Rios wheat-sowing is not, as in the Pampa region, a mere preliminary to laying down alfalfa. That plant has here a life of three to six years, but it does not attain the phenomenal growth of the west, nor, in the absence of near surface strata of water, is it so capable of withstanding a prolonged drought. Agriculture here stands purely on its own general merits. The lesson to be learned by the colonists is that farming for cereals alone is next-of-kin to pitch-and-toss, and that stock give the most sure and profitable returns when combined with intelligent agriculture. This fact has been sufficiently demonstrated by long years of bitter experience in our own colonies and by the farmers of the United States.

"The Province to-day carries 3,000,000 head of cattle, and although most of them, as in Corrientes, are native bred, they contain a growing leaven of finer breeds, notably Shorthorn, which are rapidly improving the mass. The diseases to which these are subject are the same as in the other northern and western provinces, on which I have already touched. Carbuncle is less prevalent than in Cordoba, and apparently does not get such a permanent hold on the ground. On the other hand, Texas fever is even worse than in Santa Fé, on account of the herds of cattle which are constantly marching southwards through the tick-infested marshes of Corrientes. The remedies for the first consist, as elsewhere, in inoculation by Pasteur's lymph ; for the second, timely and frequent dippings, to which should be added the burning of all dry, rush-grown bottoms at their periods of maximum infestation by the tick.

"The quality of the native-bred horses of Entre Rios is famous throughout the Plate. In proof thereof, they have furnished in former years most of the famous 'criollo' polo ponies and to-day give one of the best foundations for crossing with a faster strain.

"Tracts of ground held by the large landowners are being broken up for agriculture in two ways. By the first the colonist works the ground on shares with the owner (who usually has to advance the money for preliminary expenses), leaving the ground when exhausted and moving on to fresh.

This system, with its tendency to high expenditure and slovenly work, has little to recommend it, yet it is largely practised. By the second method the land is thrown open to purchase in instalments covering a period of four or more years, in order that the buyer may, if possible, purchase his ground from the profits made out of it after taking possession. The longer the term granted, the higher the price. It follows that both the owner and the purchaser therefore look with a very lenient eye on the linseed gamble. Yet their ignorance of the best principles of mixed farming can scarcely be blamed on the hard-working Italians, who form the bulk of the agricultural class. Themselves but a step removed from the working peon, they are naturally disinclined to venture out of a tried, though worn-out, routine. In no part of Argentina is the want more keenly felt of agricultural stations under systematic Government control.

"It says much for a faith in the future of Entre Rios that the Jewish Colonisation Society have sunk here one-third of the millions of the late Baron Hirsch in colonies on which to establish their countrymen. The character of the Russian or Polish Jew is not often a favourable one on which to build up a thriving pastoral centre, but the colonists are rapidly adapting themselves to their new surroundings. Co-operative dairy-farming has been started with marked success. This growing industry has the cordial assistance of the railway local management, which by liberal concessions has made every effort to encourage these and other settlers in their plucky uphill fight for prosperity.

"Let us recapitulate. In the north of Corrientes we find cheap breeding camps, which improve rapidly on being grazed by horned stock, but are unsuitable for sheep. The borderline of the provinces is a halting-place, where stock may be interchanged and acclimatised. Finally, on the rich lands near the delta, sheep-breeding, general agriculture, and the fattening of northern cattle may be successfully combined. Here are all the advantages of a near cash market and cheap freights for produce, an ocean port for wool and grain, saladeros for rough stock, and the great freezing factories at hand to absorb unlimited quantities of finer-bred steers and wethers.

"There is much hope for the future of Entre Rios and her sister lands. Argentine Governors are generally large landholders, and sometimes practical estancieros as well. In these provinces they are rapidly beginning to understand that their welfare is bound up with a steady development of the country's resources rather than in the arena of politics. In the near future also, the contending railroads must perforce cease from troubling, consolidating and extending their systems to that mutual benefit of colonist and shareholder for which they were originally created. Then, from the Alto Parana, from the rich basin of which Asuncion in Paraguay has long been the centre, most of the rich tropical products and all the quick traffic will abandon the lazy rivers, with their hazardous bars and twisting channels, and come swiftly across the rich peninsula. The long-horned cattle will whirl towards the south on through trucks with inches of extra fat upon their ribs, and the lolling peasant who views the inspiring sight will cast away his home-made cigarette and get a firm hold on the foreign hoe.

"We are treating of Spanish, and, indeed, to some extent, of Indian-Spanish America; yet the prophecy is not far off fulfilment. For the land, which for over a century was a bone of contention between the keen-nosed Spanish and Portuguese explorers, whose fertility received the hall-mark of Jesuit settlement, which is bounded by mighty rivers, rich forests, and fertile uplands, and while facing the ocean, holds also the key to the main gateway of the South American continent, can never fail of a generous share in the tide of progress, which is steadily carrying forward the best interests of the Argentine Republic.

The Back Country

"It is highly advisable for the intending colonist in Argentina to have a certain acquaintance with those territories which lie outside of the strictly pastoral zone. They furnish even now a home market for his produce, and as the country opens up there can be no doubt that certain of these districts will become of much greater commercial importance than is at present imagined.

"First in the list we will place the 'Gran Chaco,' a term

which, meaning literally a thicket, is applied generally to all the tract of forest land south of the Pilcomayo River lying between the Andean foothills and the Parana. Its area is close on 9000 square miles (23,000,000 hectares, to be exact), of which a bare tenth has passed into private hands, and of this, again, but a fractional part exploited. Its formation is distinct from that found in any other forest of tropic South America. A few inches of surface alluvial overlie a stiff boulder clay, from 10 to 20 ft. thick, which in its turn rests upon a substratum of pure sand. All well water must be obtained from this sand, the depth at which it occurs varying in inverse proportion to the distance of the bore from the banks of the great parent river.

"The timber in the Chaco is not continuous. It occurs in long, narrow strips, which take a north and south direction, and are interspersed with open ground in the proportion of, perhaps, 40 per cent forest to 60 per cent of prairie. These glades are, as a rule, covered with a rough pampa grass, but where the clay lies directly on the surface there is only swamp, worthless cactus, and thorny undergrowth. The whole formation irresistibly suggests a previous inundation, in which the parts now occupied by the forest have stood out above the subsiding waters. So strong is the resemblance that the belts of timber are known locally as 'isletas,' or islands.

"The value of these islands lies in the fact that their woods are composed for the greater part of 'quebracho,' a red hardwood, which also contains a valuable tanning extract. On this account it resists indefinitely the action of water or dry rot, and is much used for fence posts and general construction work. It makes the finest railway sleeper in the world, weighing nearly as much as lignum vitae, with a specific gravity of 1.27, compared to 1.33 of the latter. It thus adds greatly to the solidity of a road-bed, especially during the trials of construction.

"A league of good Chaco ground will yield 10,000 tons of quebracho logs. Thus its value depends almost entirely on the cost of timber transport to the nearest station. The limit of profitable cartage does not extend beyond 20 miles from the railway, beyond which the country is practically unknown.

"It will be seen that there is good business in the Chaco, for the value of the timber covers both the initial cost of the land and the expense of settling and stocking it with cattle. On the other hand, settlers earn their profits under conditions which are the reverse of tempting. The hard, uncompromising nature of the quebracho itself gives the keynote to the whole region. Over more than half the country the Indians, numbered roughly at 20,000, are still sufficiently hostile to make it necessary for exploiting parties to omit no precautions.

"Nevertheless, the Chaco is being steadily invaded. As the hardwoods are cut down the underbrush is fired, and its place is taken by coarse rushes and grass. This in its turn is replaced by softer herbage, which follows on the hoofs of the pioneer cattle herds. Six or eight years suffice to convert dense forest land into moderate pasture. At no very distant date the Chaco will be shorn of its dreaded forests, and the cattle-raising industry, which is now but a means of feeding the lumber-workers, will grow till the district becomes a reserve from which the alfalfa camps of North Santa Fé will draw their supply of horned stock for fattening. The present beginnings of this trade are responsible for the scourge of ticks and tick fever which infests the Santa Fé farms. The Chaco shares with Corrientes the bad eminence of being the natural home of this pest, and neglect of this and similar dangers to the pastoral wealth of the Republic constitutes one of the gravest charges against its rulers.

"Let us turn our eyes elsewhere—to the foothills of the Andes that lie west of the pampas of Buenos Aires. The moisture-bearing winds, which bring verdure by a thousand rushing streams to the valleys of the Patagonian and pre-Cordillera, are here diverted by the increasing height and solidity of the great divide. North of Lake Nahuel Huapi, the eastern slopes present for over 600 miles a barren and almost rainless tract. It is true that the soil is fertile under irrigation, but the patches which have so far been reclaimed, with the help of the hill-streams, stand out as small oases in a barren wilderness of sand, scrub, and rock.

"This is the wine district of Argentina, and in the year 1900 it produced 125,076,954 litres. The industry is chiefly centred

in the town of Mendoza, lying opposite Valparaiso, in Chile, with the Uspallata pass holding open the gate between them.

" In the broken country that lies directly north of Mendoza are located the best paying mines as yet discovered in the Republic. Gold is in most cases too thinly scattered in the hard rock to admit of profitable working, but there is plenty of copper, silver, and lead. Mining ventures in Argentina have so far met with poor fortune owing to the difficulties of transport and the situation of the lodes in places where there is neither water nor fuel within reach. Moreover, there is a general impression in Buenos Aires that a league of alfalfa and a herd of good dairy cows is better than any gold mine. They are right. For mining magnates there are few or none ; but estancieros prosper in the land, and multiply exceedingly.

" All along where these foothills merge into the great central pampas an increased rainfall permits the growth of coarse grass. Well water here is too far below the surface for even an alfalfa root to reach it, and the scanty herbage only affords grazing for a limited number of poor native stock. Fencing is a heavy item on the scattered, barren ranges, nor is there much inducement for the farmer to settle on them, when the fertile lowlands lie so close to hand. Goats abound, however, and this region accounts for the majority of the " poor man's cows," of which there are 8,000,000 scattered throughout the length and breadth of Argentina. The rider hurrying through the higher scrub of North Cordoba is often surprised by a bleat from overhead. A second glance will discover a point of these accommodating animals browsing contentedly amongst the tree-tops, whence they gaze down serenely upon the parched earth.

" On the road between Mendoza and Valparaiso lies the famous natural ' Bridge of the Inca.' This is the highway of the cattle transport to Chili, which is, however, sensibly diminishing. Owing to the rough shale-strewn roads, which it is impossible to avoid when crossing the pass, all cattle are shod before the ascent begins. This difficult task is carried through with the ease of much practice. The animals are lassoed, and thrown on their broad backs. Their hoofs are

secured to four separate stakes, and almost before they are aware of it the novel footgear is firmly fixed for the week's journey. Every peon who works in the cattle trade in this district is a rough farrier, and carries in his roll the tools of the trade.

"When we reach latitude 26 deg., abreast of the province of Tucuman, the Andean chain grows yet bolder. On the Pacific slope it preserves a fair parallel to the ocean, but it encroaches steadily on the Argentine side, throwing out fresh spurs constantly, till it reaches its maximum in the Bolivian 'massif,' which rounds off the N.W. boundary of the Republic.

"Earthquakes are felt more on the Chilian than on the Argentine side. The tops of these mountain ranges have from the date of their volcanic birth been abandoned to the mercy of fierce air currents and torrential rains. Denudation under these conditions has gathered at their base, and in the cloven valleys there are pockets of soil of great fertility, covered for the most part with dense forest, and suitable for the growth of sub-tropical and tropical produce. The province of Tucuman, called the 'Garden of the Republic,' is such a pocket, situated at the foot of the Aconquija spur.

"It would be unfair to conclude our review of the Republic without a glance at Misiones, the smallest of the national territories, which lies huddled between the upper reaches of the Uruguay and Parana, at the point where their waters most nearly approach each other. Connecting the Mesopotamia with the Brazilian highlands, there is no portion of the Republic which has been more written about, and less visited. Three hundred years ago the Jesuits recognised the value of this unique position at the navigable limit of the two great rivers. In 1732, previous to the decree that broke their power, the pioneer monks had brought under their control upwards of 200,000 Indians, collected in the thirty settlements from which Misiones takes its name to-day. The ridge, which runs through the centre of the territory to the coast plateau of Brazil, is covered with extensive pine forests (Araucaria Brazilensis), and amongst them are scattered clumps of 'yerba maté,' the universal brew that takes the place of tea to the working man in the Plate. The lower part of the land, which

borders the rivers, is covered with valuable hardwoods. But the stock-growing instinct of the latter-day Argentine colonist is opposed to tropical pioneering, so in spite of the glowing description of scientific enthusiasts, the greater part of Misiones is not only uninhabited, but even unexplored.

"The falls on the Iguazu River, dividing the north of Misiones from Brazil, are of greater height and extent than those of Niagara, though their volume is not so great or so constant. The following are the measured dimensions: Height of Niagara, 150 to 164 ft.; width, 2260 ft.; height of Iguazu, 200 to 210 ft.; width, 9000 ft. (nearly).

"The factor which must influence the colonist in his choice of a site more than any other in Argentina is that of transport, and transport here means the railroad. The only navigable rivers tap a tropical zone, which is less suited for white colonists than the healthy south. From the Plate to the Straits of Magellan, Bahia Blanca is the only port worthy of the name. On the railroads, therefore, lies the burden of the country's business, and their successful management is vital to its prosperity.

"Settlers are often tempted by the low price of rich lands into purchasing farms far beyond the railway zone. This is a good investment for the capitalist, but not for the working farmer. Against the cheapness of the land must be placed the cost of transport, which remains as a constant charge on the property, while the want of touch with markets means the loss of many a good bargain.

"If, however, he has elected to try his fortune there, the farmer should rent land rather than buy it, cut his expenses down to the lowest possible limit, and put all his money into his stock. To attempt agriculture is unwise, except to supply local needs, it is to give hostages to fortune, for a sack of wheat cannot walk itself to market, nor can it get out of the way of floods or drought, as the farmers in Chubut and N. Santa Fé know to their cost. For these reasons, cattle are to be preferred when possible to sheep, for while they give less profit, there is also less risk of total loss, and there is no point in Argentina from which their own legs will not carry them unaided to a good market.

"To live, and let live; to know how to combine healthy pleasure and sound business; to eschew politics and law-suits; to deal courteously and justly with all men—these are the lines that have been followed by those of our countrymen who have won for themselves to-day name and fortune in Argentina. There is no real obstacle to deter those who would follow their example. In the bustling marts, or on the wind-swept pampa, in the virgin forest, or beneath the shadow of the great Cordillera, there is room and to spare for all. And nowhere will an Englishman, be he home-bred or colonial, meet with a heartier welcome than from those of his countrymen whose footsteps have pointed a path to the fertile shores of the River Plate.

The Plate Coast Belt

"The sheep runs of Patagonia, the alfalfa paddocks of the central Pampas, the rich loams of the Mesopotamia—each zone of Argentina has its advocates. Yet, whatever success may have attended them in their own particular district, none will deny, when pressed to a statement, that a league of camp near Buenos Aires is worth two anywhere else.

"Apart from its importance politically, the province of Buenos Aires is, without doubt, the richest pastoral district of its extent in the world. The soil consists of from 2 to 3 ft. of black alluvial top-dressing, rendered friable by an admixture of sand and lime, while below it comes a marl, fairly free from clay, but forming under certain conditions into a hard pan, locally known as 'tosca.' Running through this formation, and separated by these beds of hard pan, are different strata of water, the first of which is found at depths varying from 20 to 70 ft., the others following at depths of perhaps only a few yards. As a rule, well-water found near the Plate estuary is of good quality, witness the numerous and flourishing breweries. As we travel west into the Pampas, the influence of its vast volume gradually lessens, till on the plains that stand midway between the Cordilleras and the coastline the water becomes brackish, and at times undrinkably bitter. This quality is, without doubt, due to the great quantity of

free calcareous matter which the soil, formerly an ocean bed, contains, and through which the hill streams percolate on their way to the ocean. The average rainfall of the coast belt is some 35 in., and with the usual interlude of a short dry spell in early summer, is throughout the remainder of the year a fairly constant quantity.

"Happy is the country without a history. Happy, we may add, is the farm that has no scenery. The traveller who has no farming interests soon wearies of the monotonous fertility of the panorama that unfolds itself to his gaze from the windows of the excellent trains that serve the rich littoral. He turns with a yawn to the distractions of his magazine, and his verdict, delivered later to inquiring friends, is that Argentina is the flattest country that he has ever seen. It may not be strict grammar—once a country is flat it stays so—but it is strict truth. Sheep at midday loom up as big as oxen in the refraction that quivers up from the hot, unvarying surface. Distances are deceiving to newcomers. The fence we start to walk out to appears to be further off than we expected. That dark clump, however, which we take to be the eucalyptus grove shadowing some estancia house is within easy riding distance, for our horizon is limited to a very few miles. As we draw nearer the tree-trunks rise up before us in the very manner of a vessel's masts at sea, and when we finally dismount in their shade we see on the new horizon around us other clumps, hull down. A colonist could plant his ploughshare in the rich, brown-black earth above Rosario, and, save for an occasional watercourse and the eternal wire fence, draw a level furrow for 700 miles straight south, to where the hills of Curumalan, rising inconsequently out of the flat prairies, mark the neighbourhood of the port of Bahia Blanca.

"Two hundred miles above Buenos Aires the main current of the Parana has scoured a deep channel at the foot of the tall bluffs that here bound its western bank. This has been a good and sufficient reason for the growth of Rosario, the commercial centre of Santa Fé province and second in importance in the Republic.

"Between Buenos Aires and Rosario is found a bed of ex-

ceptionally rich alluvial stretching some forty miles inland. This is the pick of the maize country. As the cars whirl along the long green rows come down to meet them in seemingly endless parallels, yielding to 80 bushels per acre, even under the rule-of-thumb methods to which the Italian farmer (and they are all Italians here) is wedded.

"A short 30 miles south of Buenos Aires is situated the city of La Plata, a stucco sepulchre of mis-spent capital, whose sole claim to importance lies in its title to be called the provincial capital. The mania for establishing artificial towns outside a radius of commercial activity furnishes a curious comment on the Argentine character.

"Following the coast for yet another 50 miles, we come to Cape Las Piedras, which marks the entrance of the Plate estuary on the Argentine side, and is also the upper cape of San Borombon Bay. It is an insignificant, poor-spirited bay—a quarter bite from the side of a big apple—but its name has a large significance to the most important sheep-breeding district in the country. The River Salado, rising at a point 200 miles directly inland from Buenos Aires, and resembling a long series of lagoons rather than a river, halts through a series of imperceptible depressions till it reaches the inner lip of San Borombon. Here it meets with a succession of low sand-dunes thrown up along the coast by the action of the tides. After heavy rains the water is sufficiently served by the narrow outlet of the river, whose bar has, moreover, a constant tendency to silt up.

"As the coastline falls round into the port of Bahia Blanca, it is roughly paralleled by the scattered outcrop of the Ventana hills running to meet those of Curumalan, of whose system they form a part. The height nowhere exceeds 4000 feet, and on nearing them their rugged outline is found to be fissured by numerous fertile valleys. These collect sufficient moisture to send down half a dozen streams to the coast, the longest of which does not exceed 100 miles, while their volume varies in exact proportion to the local rainfall.

"The progress of the coast belt—as indeed that of the whole Republic—is inseparably bound up with its railway development. The sandy shores do not favour a sheltered anchorage.

Between Buenos Aires and Bahia Blanca there is none worthy the name, and Buenos Aires port itself is largely artificial. Within the queen province every ton of freight and every bucket of water must be brought to its destination by artificial means. Without railways and wells, the pampa would be as impossible for modern settlers as it was for the Indians who formerly lived on the fringe of the great grass desert, crossing it only in times of stress, and then in forced marches.

"The first impulse to colonisation was given in the year 1856, when General Mitre—Argentina's grand old man—granted to the Central Railway the most liberal concession ever accorded in this country. It included the free gift of a league of the nation's land on each side of the line along the total length of its construction. The railway, which was the first to connect the towns of Buenos Aires and Rosario, formed a separate department to deal with its real estate, which it sold, and is still selling in small lots and on easy payment terms to *bona fide* settlers. Thus, the districts through which the line passed were soon colonised. As an unlooked-for consequence, agriculture for over twenty years was practically confined to the north.

"It seems nowadays almost incredible that landowners should for so long have remained ignorant of the possibilities of the great alfalfa zone in the centre, or that the finest wheat farms in the Republic (those within the radius of Bahia Blanca) should have remained untouched till a few years ago. Perhaps the real reason lay in the absence of any experimental farms. Landowners in the Argentine are a conservative class, and incline to a tried and well-worn routine rather than to experiment.

"Intensive farming is practically unknown in the Plate. The reason is that the safest investment for a farmer's spare cash has hitherto been the lands around him, which within twenty years have doubled, trebled, and even quadrupled in value. While fine stock may die and buildings deteriorate, land has none of these drawbacks, and 'is bound to go up.' So many new districts have been opened up, and their purchase and repurchase have absorbed so much of the estanciero's

money, that the margin left for improvements has been comparatively small. The land tax, or 'contribucion directa,' favours such speculation. Its percentage on the value of property is comparatively low, and is based on actual rather than potential production.

"Although the province of Buenos Aires now leads in the area laid down to agriculture as well as in the average yield per acre, there is no doubt that for many years her main interests will still continue to be pastoral. One reason has already been given for this—in the absence of agricultural stations. Another is that although commercially the importance of a new breed of wheat may equal that of blood stock, stock-breeders on the Plate coast enjoy many advantages, or, rather, a combination of advantages, which are denied their competitors elsewhere. Few artificial foods are needed, and these, consisting chiefly of maize and alfalfa, are grown at a minimum cost. The grass which springs up after the introduction of stock to a new pasture is extremely rich, while its growth is practically unchecked throughout the year. In winter the degree of cold seldom produces more than a slight hoar frost, but loss is common among thin herds in the driving south-west storms that in early spring sweep unchecked over the Pampas, lasting sometimes from three to five days.

"The natural fertility of their pastures has led many, I might truthfully say the majority, of the farmers to risk fully stocking their paddocks. This, greatly profitable in a good year, is nevertheless equivalent to overstocking, for a bad season must at times be reckoned with. With no reserves to fall back upon, the result to the farmer is then disastrous."

The freezing companies are helping to improve Argentine live-stock. Take shipments of pure-bred pigs, for instance; these are distributed through the country to the estancieros and farmers at cost price, so as to help to improve the present breed of pigs. Export of frozen pork is shortly to be very large from the country. Another way the companies help is in the prices they pay for champion steers at the fat-stock show. This is done to encourage the breeders to go in for high quality. At a recent show the champion steer fetched £2190,

and three other steers £2270 each. The Swift Company bought 116 steers for £21,800, and 333 wethers for £2164. This company has recently purchased 900,000 square metres of land in Saladillo, province of Buenos Aires, and work on a huge frigorifico is in hand. In fact, new freezing works are being erected in various parts of the country and well up the River Plate. The Government assists companies of all kinds to erect manufactories, by exemption from import duties and by making other concessions.

The Sociedad Rural Argentina proposes that a National Congress should be held in which would be represented all the cattle breeders of the country. The following points are suggested as being suitable for consideration at such a Congress : interchange of live-stock with adjoining countries ; study regarding the sale of live-stock produce ; subsidiary industries ; international exhibitions ; nationalisation of marks and brands ; roads, watering stations, and pasturage for the trooping of animals ; woolwashing and textile manufactures ; the defence of the live-stock industry ; forage, sanitary ; exportation of live-stock ; freights ; the dairy industry ; practical live-stock farming schools. It is hoped that such a Congress would be attended by delegations of the National Government and of the rural societies throughout the Republic. Neighbouring countries would also be asked to be represented, in order to discuss at special sessions of the Congress the four points first mentioned in the above programme.

Summing up the possibilities of this wonderful territory of Argentina, they are very large, and Europe can look to that country for enormous supplies, and probably increased supplies for many years to come. Naturally, as the population increases, more meat will be required locally ; but there is ample room in the Republic to increase the live-stock at a larger rate than that of the population.

Refrigerator Motor Trucks

A representative of a large cattle estancia in Argentina recently placed orders in New York for 100 refrigerator motor trucks for use on several estancias. The motors are of high

power, with a carrying capacity of at least five tons. Each car is equipped with a complete refrigerating plant, so that as the car travels it will keep meats at a low temperature for export shipment. The Argentine cattle growers plan to kill the cattle on their properties, dress the beef, load it in refrigerator cars, and so send it to the stores at the seaports and ship it to North America and Europe. The estancia above referred to, which purchased the hundred refrigerator motor trucks, is 260 miles from a railroad station. Cattle have hitherto been driven afoot from the property to the nearest railroad station or city, and there slaughtered and transformed into export beef. The new plan will cut out the slow movement of cattle on foot, and save much time and money. It will also open up new meat sources.

The Director of Rural Economy and Statistics of Argentina recently presented the following report to the Government and a statistical return concerning cattle and the consumption and exportation of meat for the year 1917, with comparative figures for the quinquennial period 1913–1917 :—

Total killings during 1917 were as under :—

	Cattle.	Sheep.	Pigs.
At Liniers slaughterhouses	404,231	1,030,292	115,900
At meat freezing works, "saladeros," and meat factories	2,496,284	2,233,896	193,383
At the 2356 municipal and private slaughterhouses which have supplied data	1,127,624	521,999	77,041
	4,028,139	3,786,187	386,324

In order to arrive at the total killings for the whole country it would be necessary to ascertain the number of animals slaughtered on estancias and farms for their own meat supplies, and in some small slaughterhouses of which we possess no data. We endeavour, however, to arrive at this total figure by another means, viz. by taking the number of hides exported and utilised in the country. During 1917, in round figures, the number was 5,873,000. Compared with the ascertained killings, this figure shows a difference of 1,845,000, so that our statistics regarding killings comprise over 68.5 per cent of the total.

Cows and Steers

The proportions of steers and cows slaughtered at "frigorificos" and slaughterhouses, registered during the past seven years, were as under :—

Years.	Steers.	Cows.	%
1913	2,402,668	506,741	17·4
1914	2,289,804	786,102	25·5
1915	2,210,919	874,926	28·3
1916	2,503,090	919,248	26·9
1917	2,803,675	1,038,918	27·0

These proportions undergo considerable variation, when we treat of the destination of the animals :—

	Total Cows and Steers.	% of Cows.
Liniers	281,950	43·4
Municipal and private slaughterhouses ..	1,070,776	54·4
"Frigorificos"	2,227,613	11·6
"Saladeros" and preserved meat factories ..	262,254	10·9

Calves are not included in these comparative returns, but it may be mentioned that they only represented 4½ per cent of the total of 4,028,139 indicated above.

Frigorificos and Preserved Meat Factories.

The figures relative to "frigorifico" killings show a marked increase since 1915, although there have been fluctuations :—

Year.	Cattle.	Sheep.	Pigs.
1913	1,608,983	2,489,461	4,756
1914	1,588,878	2,889,164	13,977
1915	1,640,846	1,948,099	43,172
1916	2,101,550	2,646,713	75,592
1917	2,496,284	2,233,896	193,383

By converting the above figures into tons, we arrive at a more just appreciation of their importance from a commercial point of view. The following table shows in tons the quantity of meat which has left the "frigorificos" and meat factories for export and for home consumption :—

Year.	Beef.	Mutton and Lamb.	Pig Meat.	Totals.
1913	519,633	65,420	357	585,410
1914	511,296	73,811	791	585,898
1915	522,557	50,765	3,533	576,855
1916	640,148	67,638	4,534	712,320
1917	690,133	56,381	15,935	762,449

Meat supplied by "frigorificos" for home consumption represents approximately 12 per cent of the total weight produced at such establishments; this is the average percentage over the quinquennial period 1912–1917, but in 1917 there was an increase of 18,163,000 kilos, and during the first six months of the current year a still further notable increase has taken place.

Exportation.

The following table shows, in tons, the quantities of dead meat for export produced by "frigorificos" and preserved meat factories :—

Year.	Beef.	Mutton and Lamb.	Pig Meat.	Totals.
1913	447,674	59,291	—	506,965
1914	444,533	68,582	299	513,414
1915	450,955	45,682	2,979	499,616
1916	584,599	62,005	2,723	649,327
1917	619,698	47,269	14,335	681,302

Home Consumption

In order to estimate the per capita consumption of meat in the Federal capital, we take as a basis the number of inhabitants as given in the municipal statistics, and the number and weight of the carcases of meat as reported by the slaughterhouses at Liniers and the "frigorificos." The following is the result, showing the consumption in kilos per inhabitant :—

Years.	Population.	Beef.	Mutton & Lamb.	Pig Meat.	Totals.
1911	1,360,406	125	24	7	156
1912	1,428,042	116	17	6	139
1913	1,480,000	106	12	7	125
1914	1,584,106	85	12	9	106
1915	1,598,511	85	10	10	105
1916	1,612,825	74	12	11	97
1917	1,624,885	76	17	7	100

It will be noted that the consumption of meat has diminished considerably since 1911, but the consumption of 100 kilos per inhabitant may be regarded as very high for a centre of population where there is such a variety of foodstuffs available as in Buenos Aires, and during a period when the cost of living has attained a high level hitherto unknown. It could be deduced from this fact that in Argentina meat is, relatively

speaking, one of the least expensive articles of food, or that, in spite of everything, the economic level of the "consumer" is, on the whole, a satisfactory one.

Cattle Weights: Live and Dead

It is always of interest to cattlemen to know how the dead-weight of a beast compares with the live-weight; therefore, a few particulars relating to the meat yields of prize animals recently sold at the fat-stock show at Buenos Aires will be of interest:—

On Arrival Freezing Works without being Fed or Watered.	On Afternoon of Day previous to Killing.	Yield of Meat—Cold Weight.	Fat.	Hides.
Lbs.	Lbs.	Lbs.	Lbs.	Lbs.
1850	1950	1233	89·3	88·2
1910	1975	1286	119	83·7
1850	1960	1252	112·4	79·4
1635	1680	1144	84·9	83·8
1725	1815	1163	106·9	79·4
1625	1655	1102	71·7	81·6
1725	1755	1128	91·5	83·8
1650	1720	1098	88·2	88·2
1300	1365	825	49·6	75

First Prize Shorthorn Cow, Cairncosh Jilt, English Royal Show, 1915. Exhibited by Mr. W. M. Cazalet

BRAZIL

Brazil extends from latitude 9° south to 30° south. It is bounded on the north by British, French, and Dutch Guiana, and Venezuela; on the west by Colombia, Ecuador, Peru, Bolivia and Paraguay; on the south by Uruguay and Argentina; and on the east by the Atlantic Ocean. It is mountainous, with vast stretches of undulating country with wide valleys containing rich pasture. It covers an area of 3,292,693 square miles, with a population of over 23 millions.

According to statistics published by the Ministry of Agriculture, there exist 30,000,000 cattle, 7,000,000 horses, 3,207,000 asses and mules, 10,000,000 goats, 7,500,000 sheep, and nearly 18,500,000 pigs.

The richest pastoral states are Rio Grande do Sul, Minas Geraes, Sao Paulo, Matto Grosso, Goyaz, Piauhy.

The urgent world demand for beef has given the live-stock industry of Brazil a tremendous impetus, and the development of live-stock raising and the packing-house industry will probably make great strides within the next few years.

Until recent years no serious attempts had been made by ranch-owners to improve their cattle breeds or the general conditions of the grazing lands. Entire lack of transportation facilities and consequent low selling prices gave no stimulus to the industry. The completion of many new lines of railroads, and the recent great increase in the price of live cattle all over the world, have given the greatest impetus to the cattle industry, with the added fact that more attention is being paid to the conditions of production and converting into meat products. Until recently the losses among cattle annually were enormous, due to diseases and the lack of proper attention on the ranches. Salt is scarce, as the country has no natural deposits, and this aggravates the situation in the case

Cattle Raising in Brazil: Typical Cattle

of epidemics. Floods in the lowland section have also been an important factor in annual losses.

With the development of the railroads of the State and the consequent opening of easier foreign markets through Buenos Aires and Monte Video, and national markets through the ports of Rio de Janeiro, Santos, Rio Grande do Sul, Pelotas and Port Alegre, the cattle industry has become more stable and the improvement in the type of cattle has been marked in recent years.

Several meat companies have erected works, and others are in course of erection. Capitalists from the United States and Great Britain have at last realised what an enormous and handy source of meat supply is available in Brazil, and are now fast developing it. The export trade has expanded in a remarkable manner, and the country bids fair soon to become one of the most important sources of supply. In 1915—the first year of foreign trading—the exports were 8000 tons ; in the following year they increased to 33,130 tons ; while in 1917 66,450 tons of beef were shipped, chiefly to the Continent, for the Italian and French armies. The beef is small and very suitable for those countries.

The Government has offered considerable advantages to breeders of cattle, to encourage the importation of live-stock. It intends also to facilitate in every way—both financially and otherwise—the importation of large numbers of first-class cattle ; the import of as many as 120,000 bulls is contemplated within the next few years. Already many head of cattle have been brought down from the United States. Many have been imported from the Argentine, and 60 Zebus were recently imported from India, fetching very high prices. A syndicate is shortly to be formed to import cattle from the United Kingdom, which is to be backed up by the Government. At present, it is only a question of bulls ; but it is probable that the idea will also expand to include the importation of cows, sheep and pigs.

The Government is willing to expend also a large sum of money to help the local breeders, and allow free transport by rail. How much more brainy are the politicians in this country than those in Australia, where the stock-owner bears the brunt of all the additional taxation and freight !

Brazil offers a great and remunerative field in the raising of cattle for beef and its many by-products. It has unlimited tracts of land served by railroads, with plenty of running water.

It can raise cattle from the valley of the Amazon in the north downward to the most southern State—Rio Grande do Sul, but the centre of this great industry will always be the State of Sao Paulo, not only for the fertility of its soil and climate, but also for its geographical conditions and railroad facilities. Most of the beef produced in that progressive part and its neighbouring States will have to be treated and shipped to Santos, the great coffee seaport. Thanks to the activity and vision of the people of Sao Paulo, the export of beef and its by-products is free.

A great many people in Brazil look upon beef as a product bound to supersede the principal staple—coffee—never realising that this product is bound to work together with cattle. The fertilisers brought out by the new industry will be a splendid contribution for the keeping of the coffee trees in better health and for longer years.

At the initiation of the National Agricultural Society (Sociedade Nacionale de Agricultura), the first conference on Brazilian cattle was recently held in Rio de Janeiro. Among the many questions taken up were :—

Probable origin of the different Brazilian breeds, causes of their degeneration, and means of improving them. Mesological influences on the various domestic animals in Brazil. Productive capacity of Brazilian cattle with reference to all modern industries derived therefrom. World statistics, producing and consuming countries. Study of the conditions of the consuming world as to quality and quantity. Production and over-production, supply and demand. Tastes of the consumer and the causes, whether permanent or temporary. Direct and indirect Federal, State, and municipal assistance in the development of the cattle industry and the improvement of its products.

Thorough and eminently practical courses on all subjects relating to cattle and subordinate industries. Formation of a corps of veterinaries, bacteriological inspectors, and necessary

experts, to be attached to all establishments exploiting the numerous secondary industries.

Commercial transactions in cattle and products ; large and small companies ; co-operation. Necessity to create standards according to the requirements of the consumer. Elements that must be taken into consideration in the location of establishments for the manufacture of and commerce in cattle products ; application of natural forces in the operation of plants, shipping ports, docks and railroad stations.

Selection of different systems for the complete utilisation of all by-products. Means of safeguarding the products for consumption ; their preservation in the plants, during transportation and at the distributing centres. Preservation of the various products by artificial cold, preserving substances, heat, evaporation, etc. Special study of all methods of refrigeration.

Organisation of transportation service with a view to speed, comfort of animals, preservation of products, sanitary requirements, and low freight rates. Direct Government supervision over transportation, from both industrial and sanitary points of view.

Study of all cattle diseases—local and imported—their prevention and cure. How to avoid propagation and to bring about the extinction of animals, parasites, and plants injurious to cattle. Improvements of pastures, extension of alfalfa culture, value of agricultural sub-products as food for cattle.

Also the best methods of raising full-bred saddle, army and truck horses, mules, donkeys, sheep, goats, pigs, and fowls ; how to improve the breeds, and a detailed study of all the industries derived from these animals.

Establishment of zootechnic stations and model farms. Practical and economical means of collecting statistics of all the animals of Brazil. Necessity of studying a progressive taxation system to assist the production, consistent with the Government's interests. Legislation. Uniform sanitary inspection of animals in all the States. Prizes to raisers who introduce new processes to improve breeding.

This shows that the Brazilians are alive to the importance of their pastoral industry.

Brazilian cattle derived from the primitive herds are small, weighing on an average about 400 lbs. dressed. However, the importation of sires is rapidly taking place, and the improvement already is most noticeable.

In a paper I read in Chicago before the Congress of Refrigeration in 1913, I forecasted exactly what has happened. In that, I said that Brazil and South Africa would be large suppliers of frozen beef in the near future, and they are both rapidly increasing their herds and their output. Many freezing establishments are in full work in Brazil, and more are in course of construction; a full list of these will be found in the Appendices.

Transport facilities are being rapidly developed, and new refrigerated steamship services between Brazilian ports and New York have been inaugurated. It is not only in the south, however, that this development in meat shipments is taking place. The Compania Pastoril Agricola-Industrial Piauhyense, with a large capital, has been inaugurated to go into the business of raising and slaughtering cattle and packing meat in the State of Piauhy, in the north ; it is in the tropics, but that is no drawback. Most of Australian cattle also are well within the tropical belt. Large areas in the State of Piauhy are excellent cattle country.

Brazilian meat is of excellent quality, a recent shipment having shown that the industry is developing on right lines with gradual improvement of stock.

Mr. Duncan Black, a Queenslander who has been resident for several years in South America, recently revisited Australia, and during his stay he favoured me with some first-hand information in regard to primary production in South America. Mr. Black has been closely associated with the cattle trade, and has had unique opportunities of studying its possibilities. With Brazil he is particularly impressed, as he states that this great territory is on the brink of what must prove to be marvellous development.

The soil and climate of Brazil, according to Mr. Black, are excellent, and the country is permanently watered with rivers and creeks. Water can also be obtained by shallow sinking. Until recently the cattle industry had not been seriously con-

sidered, production having been confined chiefly to coffee and rubber. Now, however, the suitability of Brazil for cattle-raising is being recognised, and the country is going ahead by leaps and bounds. The Government is aiding this progressive movement in a most practical manner. A bonus of from £27 to £34 is given for every stud cow or bull imported into the country. All implements, fencing material, and other things required by settlers are admitted duty free, and in each of the twenty-one States of Brazil there is a Government stud farm where stud bulls and stallions are kept for the free use of farmers.

Every facility is given to encourage occupation of the land. The freehold title is made as easy as possible to obtain. Anyone wishing to secure land makes application for Crown lands available, and the matter is put through with as little delay as possible. Land values range from 1/6 per acre on the high country to £3 per acre on the deltas of the Alto Paraguay, which is excellent land free of disease.

Mr. Black states that the natural grasses of Brazil are not very good on account of the periodical burning-off they have been subjected to, but it is an easy matter to improve the pasture. The climate and soil, on the whole, are not suitable for alfalfa (lucerne), but a good substitute is found in the native grass jaragua. This grass, apparently, is a great drought resister, and is wonderfully prolific, easily carrying a beast to the acre. To establish jaragua it is only necessary to burn off the rank grass during the rainy season, and then scatter the seed, which is very light and easily obtained. The seed germinates immediately after rain, and the young plants are very fast growing. The first growth of jaragua is left until it seeds, which it does very plentifully. When the seed has been shed, the grass is heavily stocked with cattle, and is well tramped down. The stock are then taken off and the grass is burned off. The young grass comes away again very quickly, and when about 9 inches high is again stocked heavily, and from then on is never allowed to grow higher than eight or nine inches. After about two years of stocking, this jaragua grass undergoes a change, stooling out instead of growing straight up. It also becomes finer, and can be cut for hay,

yielding heavy crops. It is the main stand-by, but another useful grass is angola, a very hardy grass, drought resisting, but not quite so heavy carrying as jaragua. Mr. Black considers that both these grasses would do splendidly in Australia.

The Rio Grande do Sul is the only province of Brazil which has so far gone ahead in the cattle-raising business, chiefly on account of its proximity to Uruguay and Argentina, where good bulls can be obtained at a reasonable price. The rest of Brazil, according to Mr. Black, is on the brink of rapid development. The basis of cattle breeding is the native herds, which are descendants of Spanish cattle run wild. The importations being made are chiefly Shorthorns, which nick well with the native cattle. Texas fever is the only disease that troubles cattle in Brazil, but it only affects imported cattle, native herds being naturally immune. It is now, however, only a question of the Government arranging to have the imported stock inoculated to remove all risk.

There are no restrictive conditions in regard to taking up land in Brazil. There are no labour troubles, wages on cattle stations ranging from £3 to £5 per month. The native is a good worker, but he has to be taught to handle stock kindly and patiently. Railway construction is proceeding at a great rate, for which purpose English and French capital is pouring into the country. Communication, except in a few remote corners, is very easy, either by river steamers or trains. This was before the war, since when, naturally, the influx of capital has stopped from Europe, but a good deal has been going in from the United States.

As an instance of the progress taking place in Brazil, Mr. Black mentioned that the American Farquhar Syndicate recently bought up a very large area of land in different parts of Brazil and Paraguay, which they are proceeding to develop. The syndicate brought a competent staff from Texas to work the properties. They are stocking up as fast as possible, and recently imported 1000 bulls from Texas. Of late years English people have purchased large properties, and many landholders in Argentina have sold out and gone to Brazil. The Government gives agriculturists farms ready made.

In conclusion, Mr. Black said : " After experience in Australia and Argentina, and having been all through Uruguay, Bolivia, and Paraguay, I consider there are no better opportunities for brains and capital than in Brazil."

Brazil as a Pastoral Country

Of the twenty-one Brazilian States, " Rio Grande do Sul " is by far the most advanced in pastoral matters, chiefly owing to the fact that the State is in close touch with Uruguay and the Argentine, of both of which countries she forms the southern Brazilian limit. Although the class of cattle bred is not to be compared to the stock of the other two countries mentioned, breeders are now making every effort to improve their herds, and with satisfactory results, as they are now disposing of a good number of stock for freezing purposes. Until recently all the cattle bred there were slaughtered for the purpose of making " Xarque " for export to the other States, but with the improvement which has come in the quality of the bullocks, breeders find that it is more profitable to dispose of their stock to the works buyers, and consequently are importing good bulls in large numbers. Several breeders, thinking that the Zebu would be better than the English breeds, acting on the advice of breeders in the States of Minas and Sao Paulo, where the Zebu has a great reputation, imported them on quite a large scale. No doubt there was a certain amount of reason for importing Zebus years ago, for the simple reason that they are very hardy, and immune from tick fever, which holds sway over all parts of Brazil. The first cross with the native cows gave a rakish, big bullock, and although the meat is very coarse, yet when fat it made good xarque, and that was the " end in view."

The State next in order to Rio Grande is Minas Geraes, which lies north and west of the State of Rio. Here we find the Noah's Ark as regards cattle, every breed under the sun being represented, that is, if we except the English breeds. Minas is the home of the Zebu, and some very nice specimens are to be seen during one's travels, which is not to be wondered at, considering the money spent in purchasing them.

Some few years ago the Government of this State made a contract with an English firm in Rio to deliver a thousand bulls, meant for distribution amongst the breeders at cost price—£100 sterling each. Of the total, 900 were Zebus imported from India, and the balance was made up of Swiss, Dutch, and a few English cattle. It is not an uncommon thing for some Zebu fanatic in Minas to pay as much as £1500 sterling for a bull he fancies.

Unlike Rio Grande, which State has excellent native grasses, Minas does not possess native, or, rather, natural camp of any great value. The country has had to be improved in order to carry cattle profitably, and this has been done in a way which one is forced to admire, against one's will. Most of the land under jaragua or gordura, which are the best grasses, were at one time useless half scrub and half open forest country, and were improved in the following manner: Narrow tracks about ten feet wide were cleared at different distances, according to the density of the scrub, and the brush piled in rows, which, after having been allowed to become thoroughly dry, were set fire to during a very hot day, generally in the month of November, and when there was a fairly good breeze blowing. Naturally, the dry leaves and grass were completely burnt off, together with the many smaller shrubs, after which the seeds of the grasses mentioned were scattered about, generally by men on horseback, with the result that after the first rain the grass came away quickly and smothered any new growth of shrubs, the ashes left after burning being an excellent grip for the seed, which is very light. November and December being both good rain months, the grass made quick progress, and the land was left unstocked until June of the following year, when the grasses seeded very profusely, and then the land was stocked heavily. After some time all the seed would be well tramped into the soil, leaving, of course, quite a lot of decayed vegetation, which was burnt off on the first favourable day, after a shower of rain, and when the old grass was dry. As soon as the fresh sprout came away, the land was again stocked and the grass never allowed to become rank. This may seem to be a very haphazard way of doing things, but as time was no object, and land was cheap, the results were satisfactory.

Some beautiful fattening lands may be seen which have been formed in the manner described, and as grazing lands they are hard to beat, carrying during the summer months as many as two head of cattle to the acre, and averaging one beast to the acre all the year round. During the winter months the grass goes off to a certain extent, but makes quick headway with the arrival of spring. These lands are all naturally watered, it being a rare thing to see a well or dam constructed in any part of the country, and being close to the federal capital have increased in value very quickly. For the newcomer the prices are a little high ; but many opportunities occur when land can be bought at a reasonable rate.

Next in importance to Minas, from a pastoral point of view, come the States of Goyaz, Matto-Grosso and Parana, and in any one of them the newcomer may find excellent opportunities for investment.

Being further inland, land is much cheaper, and, looking at matters from a practical point of view, these are the best States to invest in. Large tracts of open rolling downs, well watered by running streams, can be purchased for next to nothing ; but although the soil is of excellent quality, the grasses are, generally speaking, very poor, owing to the fact that the land has been burned for centuries, and the more tender grasses exterminated. Land can be bought at from 2/- to 5/- per acre, according to the distance from the railways, and, economically worked, can be improved at about 4/- per acre. As in the State of Minas, burning the grass off when thickly covered, and then sowing the grass seed, has been until now the most popular way, but this is not to be recommended. The best way is to run the plough lightly over the land, say, to a depth of four inches, harrow it, and sow immediately, during the months of September, October, November, and December, which are the rainy months, and Nature does the rest. The native grasses have very superficial roots, and, when turned over by the disc, which is the best for the purpose, become extinct, as after the first shower of rain either jaragua or gordura come away quickly and choke out any few remaining plants. The grass sown in September, that is, provided that the seasons are normal, can be grazed by Decem-

ber, and the stock kept on until April, when it is advisable to retire the stock, allowing the grass to seed, which it does about the middle of June. After collecting the seed required for future operations, it is restocked heavily, and when well beaten down, if the time is favourable, it may be burnt to clean away any dry rubbish.

Matto-Grosso and Parana are the two States where the famous Farquhar Syndicate, under the denomination of the Brazil Land, Cattle, and Packing Company, is working on extensive lines. The total extension purchased by this company is approximately 6,500,000 acres, the greater part being in Matto-Grosso, and includes a lot of excellent natural camp in what is called "Pantanaes," or, in other words, land situated on the banks of the Upper Paraguay river and its affluences. These lands are subject to floods, but are excellent for cattle-raising, the only drawback being that the horses suffer severely at times from "Cadeira," as it is called, a disease similar to the horse disease of South Africa. With care, however, the losses are not great, but unless the horses are inspected each morning, and steps taken against the disease spreading, all the horses on the property may be lost, the disease being very contagious.

For the small capitalist, with, say, from five to ten thousand pounds to invest, provided that he is a practical man, and not afraid to work, the south of Matto-Grosso is a good place. For those with larger capital, it is still better, as by importing good bulls in number sufficient to put with all the cows straight away, instead of having to wait, and improve by using half-bred sires, speedy results can be attained, to say nothing of the fact that the larger capitalist could also improve his land much quicker than the man with smaller means. The Government gives free transport for all sires over their lines, and by subventioned lines of river steamers, and the private companies have followed suit. Seed is carried free, and agricultural implements at nominal rates; this refers to all lines.

With the shortage of cattle in many countries affected by the war, there is no doubt that Brazil is one of the best countries to invest in, taking into consideration the quality and price of the land.

An Australian, now resident in Brazil, writes to me: "Brazil with her vast extent of excellent cattle-raising lands, abundantly watered and easily improved, offers opportunities not to be met with in any other part of the world. No other country is so lavish in Government assistance to pastoralists or farmers; but still progress has been slow in both these pursuits, mainly on account of the lack of initiative of private individuals. The average Brazilian likes politics better than work, so there is plenty of room for the man who wants to work intelligently. To the Australian who has a little capital, I can truthfully state that, comparing the two countries, I prefer Brazil, that is—there is no domineering Government whose one idea seems to be to invent new taxes for those who keep the country going, no labour unions whose one idea seems to be the ruining of the honest working men by not allowing them to do enough work to keep them physically fit. I will not claim that the Brazilian Government is a model one; it makes no pretence to be perfect, but to its credit may be said that it helps those who are engaged in either of the industries referred to, realising that the future of the country depends on them.

"As to the railway communications, they are much better than in Australia. One can travel comfortably, and at a reasonable rate, anywhere, if the Central Railway—a Government-owned and controlled concern—is dropped out. It is a remarkable thing that Government-controlled railways in any part of the world are usually failures (especially is this so in the Commonwealth of Australia, where you have one of the worst of services, and yet many Australians have asked me if we have decent railways in South America). The 'Central' (Government owned) Railway costs the country the small trifle of about a million pounds sterling yearly in dead loss, yet lately, an English company offered the bagatelle of £12,000,000 sterling for the 'concern' as it stood. Naturally, the offer was refused, because there are a lot of 'political friends' to be protected; and so it goes on losing money for the country, instead of being a 'paying concern,' as it would be were it in the hands of a private company.

"I do not wish to paint everything the colour of roses as regards Brazil, and I am sure that any Brazilian who may

read this report will cordially agree with me as far as railways are concerned:

"If we take any of the other railways of the country into consideration there is no complaint to be made against them, that is, as far as the private companies are concerned. The Paulista, one of the great tracks of the country, may be compared with the best in the world, to say nothing of the Leopoldina, which compares quite favourably with the former. The latter company has done quite a lot for the progress of the country by installing a 'model farm,' where lads may go for instruction in the art of preparing all kinds of dairy produce, and lately it has started a 'travelling agricultural wagon,' which travels all over the line owned by the company, showing all kinds of implements, and the expert in charge gives all the information required.

"The former company, the Paulista, have also done pioneer service, insomuch that it is chiefly owing to the efforts of the general inspector, Dr. F. Monlevade, that the export of meat commenced."

There are some splendid flocks of British breeds of sheep owned by a few of the best farmers. In the Rio Grande the Southdown is preferred, and the wool produced is abundant and fine; the Romney Marsh is suitable for most parts of Brazil. The plateaux of Parana and Santa Catharina and Rio Grande with an average of 2000 ft. elevation, are well suited to sheep. Also Central Brazil, 3300 to 4000 ft. altitude, with its glorious climate, is specially suited, and in the Rio Grande do Sul there are already over 2,000,000 sheep.

A London Syndicate, with a capital of £1,000,000 for the purpose of stock-raising in Brazil South, is in existence.

There are vast expanses of pasturage available for cattle-raising. The Brazilian Railway Company have purchased 7,000,000 acres of grazing land, and they say it is just as good as the best North American prairies, and there is sufficient supply of native stock to ensure the rapid development of a prosperous industry on a very extensive scale. The Company have already over 150,000 head of cattle, and the number is fast being increased by local purchases, while large numbers of stud cattle are being imported.

Summing up, Brazil with its 30,000,000 head of cattle, with the importation of good bulls, American and British brains and push, and with its far-seeing politicians, together with its proximity to the big markets of the world, is bound to be within the next ten years a very large supplier of beef, possibly as large as that of its southern neighbour, Argentina. It is a great field for capital, and one where Labour Unions have not, and are not likely to have, the opportunity of throttling individual and natural progress.

GROUP OF SHORTHORN COWS AT THE ROYAL FARM, WINDSOR, ENGLAND

OTHER SOUTH AMERICAN STATES

URUGUAY

URUGUAY, which extends from latitude 30 deg. to 40 deg. South, is bounded on the north by Brazil, on the south by Argentina, the west by Paraguay and Argentina, and on the east by the Atlantic Ocean. The area of the country is 72,210 square miles, and the population about 1,750,000. It is the smallest of the South American States. It has a wide, almost unbroken, sweep of park-like plains with no big mountains. It has a network of rivers, and so is splendidly watered ; 700 miles of the rivers are navigable. The camp, or grazing country, is of a gently rolling nature, and it is difficult to find any large part of it unprovided with a bountiful water supply. The soil is deep and arable, and supplies good pasture for the herds of cattle and sheep grazing on it. The climate is mild, with no extremes of heat or cold, and the live-stock industry is the chief source of the country's commerce, 37,500,000 acres of the total area of the Republic being given over to pasturage.

For a long time the preparation of jerked beef (tasajo) was a leading industry in Uruguay, and during one year over 700,000 cattle were slaughtered for this product alone, making over 113,000,000 pounds of meat, with a value of about £1,300,000.

The number of cattle is about 8,000,000 and of sheep about 12,000,000. My last visit to Uruguay, in 1913, showed me that very great improvement has taken place in recent years in the flocks and herds through the introduction of stud cattle and sheep from Great Britain. Merino sheep predominate, and the wool industry is a large one. Refrigeration has stepped in, and the exports of meat are jumping ahead. As most of the cattle are beef cattle, there is no reason, except shortage of freezing works, why the export of beef should not amount to 1,500,000 quarters per annum even at the present time.

There is another process by which cattle meat is utilised. Few people are aware that much of the beef extract on the markets comes from the special establishments in Uruguay erected for that purpose. The name "Liebig" is now actually synonymous with beef extract; and the company's factory is at Fray Bentos, on the Uruguay River, about 100 miles above Buenos Aires, but where there is a depth of water sufficient to allow the entrance of vessels of a draft of 20 ft. Fray Bentos has been called the greatest kitchen in the world, and on some days 2500 head of cattle are slaughtered and treated.

There is room for greater development, because, with all that has been accomplished, the limit of economic productivity is a long way from being reached. With the steadily increasing demand for meat and meat products in all the consuming markets of the world, with the well-known adaptability of the people of Uruguay for agricultural and pastoral life, with the encouraging tendency to aid immigration to the country, and the facility with which new settlers are absorbed by the population, Uruguay takes a favoured place among the cattle countries of America.

A Uruguayan law of 8th January, 1916, extends for five years the period during which building material and machinery for the construction of meat-packing establishments are to be admitted free of duty. The exemption from duty of such articles was previously authorised for a period of five years by a law of 13th July, 1911.

The first freezing plant in Uruguay was the Frigorifica Uruguaya, established at Montevideo. It has a present daily capacity of 1200 steers and 4000 sheep. In 1911 Swift bought three jerked beef plants located near Montevideo, and commenced the erection of a freezing plant with a capital of 4,000,000 pesos. The company soon became a leading factor in the Uruguayan cattle market, and has a present capacity of 2000 steers and 3000 sheep per day. A Morris plant, known as the Frigorifico Artigas, has a capacity of from 1000 to 2000 steers, 2000 sheep and 500 hogs per day.

PARAGUAY

THE Republic of Paraguay is situated in the centre of the South American continent, between latitude 17·15 deg. and 27·31 deg. S., and longitude 54·5 deg. and 62·30 deg. W. The country has no seaboard, being bounded on the north by Bolivia and Brazil, east by Brazil, south and west by the Argentine. Paraguay proper, the area of which is estimated at 65,000 square miles, lies between the rivers Paraguay and Alto Parana, and is bounded on the north by the Brazilian province of Matto-Grosso. To the west, between the rivers Paraguay and Pilcomayo, lies the little-known region of the Chaco, the area of which is estimated at 107,000 square miles, or about that of Italy. All Paraguay belongs to the formation of the low-lying region which is comprised between the Brazilian coast range on the east and the Andes on the west, and through which the two great waterways, the Paraguay and the Alto Parana, flow towards the south and pass into the vast estuary of the River Plate. Paraguay proper consists for the most part of a level or gently undulating plain, from which in some places low hills rise abruptly. These hills nowhere reach a height of more than 2000 ft. above sea-level, while the average height of the plain is about 550 ft. The level country consists of grass land alternating with woods and forests, the latter occupying the greater area, while the higher ground almost everywhere is clothed with dense forests. It is well watered by the numerous tributaries of the great rivers, while a large part of the level ground on the west side of the Cordilleras is swampy and liable to inundation. The Chaco differs from Paraguay proper in that it consists exclusively of level, scarcely undulating, ground unbroken by hills of any kind. The greater portion of the territory, which seems formerly to have formed the bed of an inland sea, may be regarded as the delta of the

River Pilcomayo. At the last census, 1915, there were 5,250,000 cattle and 600,000 sheep in the country.

The live-stock industry in Paraguay is one of the most prosperous, and one of the most productive. There is a sure market in the country or in the Argentine. The commercial world has discovered in Paraguay an appreciable reserve in live-stock, and the demand will continue to increase, and under improved management so will the supplies.

Paraguay lands have always been noted for their healthy condition, and Paraguay stock for their prolificness. Animals are born and develop with very little personal attention. The abundance of pastures, water, and the scarcely sensible climatic changes offer exceptional conditions suitable for live-stock production. If the almost wonderful resources of vegetable food were added to the natural conditions of the country the results would be doubled. The inter-breeding during centuries among the native animals, and the negligence in preserving the camps, abandoned for centuries, have produced in the Paraguayan live-stock a considerable depreciation in quality.

Good management will correct these defects. The crossing of the native with pure breeds should be the first improvement to be undertaken. The cattle rancher's object should be the improvement of the breed ; that is what is really needed. The system employed until lately by ranch owners has been to hold large tracts of land, unattended, with a heavy number of animals, without occupying themselves with breeding good animals ; this system must be abolished. What can be done will be seen by the excellent lessons given by the neighbouring Republics which have obtained the renewal of the greater part of their stock, with enormous benefits to the industry.

Meat is naturally very cheap, perhaps cheaper than in any other country in the world, since a bullock $3\frac{1}{2}$ to 4 years old is worth only 15 dollars to 20 dollars gold. The hide, tallow and grease being worth alone one-half that amount, there remains, say, 10 dollars, as the value of 300 to 350 lbs. of meat, being less than 4 cents per lb. for meat of the best quality without bones.

There being such an abundance of cheap meat, the Govern-

ment of Paraguay, desirous of encouraging the meat preserving industry, has just lately passed a law providing for the introduction free of duty of all things necessary for equipping such a factory, and has provided for the very small export duty of 15 cents gold on the finished product of each bullock or cow.

Paraguay, with about 1,000,000 inhabitants, is a country so thinly populated that it must take a century or more before it becomes short of pastures for breeding cattle, horses, mules and sheep.

Pretty well throughout the country you can run a beast to four acres. In fact, that number of acres for a beast is a Government minimum. This law is in force in several States of South America, viz. that the number of beasts is limited on a set amount of land—a wise provision to stop over-stocking. Large steamers can go up the River Plate and the Parana as far as Asuncion (capital), 650 miles from Buenos Aires.

An extract and canning factory at San Salvador, Northern Paraguay, has been constructed. This is under American management, and has a capacity for treating 150 head of cattle daily for extract and 350 for corned beef making. Stock-raising is the basic industry of Northern Paraguay, and the North Americans have invested large sums of money in the country lately. A company incorporated at Delaware has spent 1,000,000 dollars in the Paraguayan Chaco, which is practically unknown, and which, when opened up, should afford excellent pastures.

The Frigorifico Paraguay Carne Conservada has been organised in Asuncion for the purpose of erecting meat freezing and canning works. The company intends to erect a plant capable of dealing with 300 head of cattle per day.

CHILE

THE Republic of Chile lies between the Andes and the South Pacific, between latitude 17 deg. 15 min. and 55 deg. 59 min. S., and longitude 66 deg. 30 min. and 75 deg. 40 min. W. Its extreme length is about 2800 miles, the coast line is about 2625 miles, and the average width 90 miles. The Andes form the eastern frontier, with an elevation of 5000 to 10,000 ft. above sea-level, and the highest point, 22,422 ft., is Aconcagua, an extinct volcano. The total area is about 291,500 square miles, with a population of 3,500,000.

There are at present about 2,000,000 cattle and 5,000,000 sheep in the country. In the far south, with Punta Arenas as a centre, there are large flocks of British breeds of sheep and several meat works operating. A very high class of mutton is exported, while the stock-owners are British born, and several New Zealanders have settled there.

The northern part of the country is comparatively bare of pastures, but rich in minerals. The central has fertile plains and a temperate climate; here cattle-raising is carried on largely.

PATAGONIA

In describing the plains of Patagonia recently one writer says : " Shut your eyes and think of yourself with a good nag between your legs going at an easy canter over the soft and grassy pampa. Above you a turquoise sky and a brilliant sun, below you blue lakes, soft turf and sparkling streams, on the lakes and rivers black-headed swans and pinky-winged flamingoes, geese, and ducks galore, and now and then a jacksnipe. Small foxes play about you like kittens, and ostriches leg it away a hundred yards ahead of you, their long necks stretched out, and their wings highly lifted to help them out of the danger zone. The life and place so enchanted me that a year later I became the owner of much camp, 16 leagues, and many sheep. In the middle of my property is a lake five miles by two miles across." The farm is now earning 50 per cent dividends ; and this is a true picture of Patagonia. There is one British company there owning six million acres of land, upon which there are 1,500,000 sheep, and which regularly imports studs from Australia and New Zealand, or they did until shipping facilities failed them. In Tierra del Fuego the company owns also 2,250,000 acres of good sheep country. The manager of this is a New Zealander, like so many men in Patagonia. Chile can be depended upon for frozen mutton in increasing quantities, but beef cannot be looked for in any but limited amounts.

The following account of the development of meat freezing in Patagonia I have quoted from a paper entitled " Sheep Freezing in Patagonia," read recently by Mr. R. J. Cracknell before the Cold Storage and Ice Association :—

" The sheep-freezing industry in Patagonia was started by the erection in 1903–4 of freezing works at Rio Seco, on the shore of the Magellan Straits, about eight miles from Punta Arenas, by the South American Export Syndicate.

" These works were followed two years later by similar works at St. Gregory Bay, about 70 miles from Rio Seco, and later by other works at Puerta Borico, on the shore of Ultima Esperanza, an inlet from the Pacific, and about 180 miles from Punta Arenas ; also at Gallegos, in Argentine Patagonia, on the Atlantic, about 200 miles from Punta Arenas, and in 1917 works were started in Punta Arenas itself.

" The season in Patagonia is a very short one, lasting usually from the middle of January to the latter part of May, the actual working time being a little over one hundred working days.

" For the remaining part of the year the works are closed down, during which time extensions, alterations, or repairs are effected.

" For this reason, during the season work is carried on at high pressure, and it is of the utmost importance that everything should go smoothly and without hitch.

" In arranging the programme for the season, the ideal aimed at is that the sheep shall arrive at the works at the same rate that they can be killed, which varies from 3000 to 4000 per day.

" As the sheep are sometimes as much as fifteen days on the track, walking from the farm to the works, a programme is got out and arrangements made for several weeks ahead.

" Every sheep is selected by the freezing works' own ' approvers,' who visit the various farms for this purpose. In some cases the approver will go through 10,000 sheep in selecting 3000.

" A part of the sheep for the San Gregorio, Rio Seco and Punta Arenas works are also brought over by steamer from Tierra del Fuego.

" Most of the works have a canning plant in addition, and at the Bories works they have a fellmongery where they treat their own skins. There is also a fellmongery at Tres Pontes, about three miles from Punta Arenas, where the skins from the Punta Arenas and Rio Seco works are treated. At these works as many as 6000 skins can be treated per day.

" The method of loading varies at the different works, the general method being to load the carcases into trucks, which are then run down to a pier, where they are transferred to the

steamer. In some cases, owing to there not being sufficient depth of water for the steamer to come alongside, the carcases are transferred to barges, which are towed out to the steamer lying about half a mile out. From 200 to 300 tons are loaded per day.

"The total number of carcases brought to England from all these works is about 1,350,000. The steamers arrive at rather long intervals, and are anxiously awaited by the works' managers, especially as under present conditions the arrivals are very uncertain. In some cases the stores are entirely filled, and half the freezing rooms used as stores before the steamer arrives. Another day or two of delay would bring the works to an entire standstill, the consequence of which would be disastrous, as it is impossible to stop the arrival of the sheep. In a few days there would be 10,000 to 15,000 sheep around the works with no adequate feed for them, this having generally disappeared before half the season is over.

"In addition to the works mentioned there are also freezing and canning works at St. Julian, which are owned by Swifts. New works are on the point of completion at Rio Grande, in the island of Tierra del Fuego, and works are projected, and now in course of construction at Natalis, near the Bories works, and in opposition to these works. The Rio Seco works is the only British company, the others being Chilian, except the Gallegos and St. Julian works, which belong to Swifts.

"It will thus be seen that it was a British firm that first had the courage and energy to undertake the erection of freezing works in that remote region. The difficulties met with in carrying out this work were enormous, owing to want of facilities. The success of the undertaking was immediately followed by the forming of local companies for erecting the other works, as already explained, but the country is greatly indebted to this British firm for the prosperity that has followed the initiation of this industry."

UNITED STATES OF AMERICA

As regards live-stock the United States is not by any means as spent as it was generally supposed to be. It is nearly ten years since the world was informed that the internal demand had overtaken the supply, and that the United States would have to look to Argentina for beef and Australia for mutton with which to feed her own people. What do we see now? The number of cattle marketed during 1917 was 12,278,000 in the nine principal markets—it was the largest in the history of the country, but, in spite of this, there were more cattle on the farms at the end of the year than at the commencement. The exports of fresh beef from the United States increased from 6,400,000 lbs. in 1914 to 231,000,000 lbs. in 1916. The exports of bacon in the same period increased from 194,000,000 lbs. to 667,000,000 lbs. The total weight of all beef products exported from the United States in 1917 was 411,000,000 lbs. The weight of pork products was 1500 million lbs. The average amount per head received for beef carcases and by-products was £19/7/6. Of this sum, £17/11/7 was paid to the grower, 10/8 for killing, dressing, etc., 9/7 for freight, 10/3 for selling expenses, and 5/5 represented profit. Frozen meat in storage on July 1st, 1918, increased 49·3 per cent, and frozen pork increased 71·37, as compared with 1917. These remarkable figures show what American stockmen can and will do when called upon in some emergency. The stock-breeder in the United States is not likely to be handicapped by the Government fixing a maximum price for meat. In fixing a price for fat cattle, should such a thing have to occur, a minimum price should be guaranteed, and the cost of rearing and fattening, of course, taken into account at the time.

To the ordinary mind "price control" carries with it the idea of keeping prices down, while, as a matter of fact, it is

production and not price that is important at a time like the present. Price control should mean stabilizing and fixing prices on a basis which will insure the greatest production, and thus automatically prices will come down.

The latest returns published by the United States Bureau of Statistics in January, 1918, estimate the existing number of cattle in that country at 66,830,000 head, an increase of 3,100,000 (or 4·9 per cent) over the previous year's total of 63,700,000 head ; and 18·2 per cent more than the low-water

A United States Shorthorn Bull
Champion at thirty-six shows.

mark in 1913, when only 56,527,000 head were recorded. Sheep were returned at 48,900,000 head, as compared with 48,500,000 at the end of 1916. The figures in respect of cattle indicate that steady progress is being made in replenishing the herds of the United States, which had suffered a continued and serious decline for several years prior to the war.

In other words, the number of cattle on farms is greater to-day than ever before, and this in spite of the fact that the number sent to market for slaughter in 1917 was the greatest in the history of the country. It is not generally realised by the public that the record marketings of both 1916 and 1917

have been accompanied by a decided increase each year in the number of cattle left on farms.

In a recent letter to members, the American National Live-stock Association says :—

During the year 1917 the number of cattle sent to market for slaughter was the largest in history, and the fact that our supply on January 1st, 1918, showed a substantial increase, despite the larger slaughter, is convincing evidence that at present there is no shortage of beef cattle. With the exception of 1916, the shipment of hogs to market during 1917 was the largest ever recorded, and the present supply exceeds all previous yearly estimates. . . .

The live-stock industry of the United States responded to the appeal of President Wilson, the Food Administration, and the Department of Agriculture for increased production.

More and more, as demands grow, do the greater production of live-stock and the conservation of meat become pressing necessities. While there has been a numerical increase in live-stock in the United States in 1917, the tendency of farmers to ship their cattle and hogs before they are properly finished, due to advanced cost of feed and eagerness to get high market prices, has brought about a decreased poundage per animal.

The records, borne out by those of the industry in general, show a loss of weight of approximately 10 per cent in 1917 as compared with 1916. This offsets the increase in numbers.

During 1917 Armour & Company paid to live-stock producers in the United States alone the sum of 341,743,275 dollars (£68,348,655) for cattle, hogs and sheep, or 109,167,133 dollars (£20,000,000) more than a similar poundage would have cost at the 1915 scale of prices. This additional sum necessarily had to be collected from consumers to be turned over to producers.

Obviously, we must look first to the producer. For him the Government has largely taken the speculation out of production, and inasmuch as his gains are assured for years to come, he can combine patriotism with profit by increasing and improving his herds.

He must breed for quality that will produce maximum

weight in the shortest time. Every unused nook and corner of his farm should grow feed for his animals. Surplus dairy calves should be fed no longer than is necessary to bring them to the veal stage, thus conserving feed, while beef calves should be saved and brought to earliest maturity.

Centralized Live-Stock Marketing

An official report of the U.S. Department of Agriculture on the causes of the decline of the pastoral industry in the United States of America gives the following interesting account of the centralized live-stock marketing system engendered under the regime of the American meat companies :—

"The largest single factor in the marketing of meat animals in the United States is the system of centralised live-stock markets, which has no counterpart in any of the other live-stock producing countries of the world. Its development has been due primarily to the fact that the live-stock industry is developed mainly in the central and western parts of the country, while one-half of the population is in the manufacturing region east of the Mississippi and north of the Ohio and Potomac Rivers. The exportation of meat animals and meat produce from Atlantic rivers also has contributed largely towards the centralisation of live-stock markets at points intermediate between these ports and the areas of production.

"A corollary of the unprecedented development of our centralised markets which generally is regarded as of vital importance is the gradual concentration of ownership and control of the stockyards, terminal facilities, and other equipment and related interests, into the hands of the small group of packers who purchase the bulk of the meat animals sold at these markets. The nature and extent of this factor in the situation have been stated by Mr. A. E. de Ricqles, Chairman of the Committee on Stockyards, of the American National Live-Stock Association, at a hearing conducted by this office, as follows :—

" 'The first thing that one meets in looking into this subject is the fact that the ownership of practically all the stockyard

CHAMPION SHORTHORN COW AT THE ROYAL SHOW OF U.S.A., MAXWALTON MINA 8TH
Owned by Messrs. Carpenter and Ross.

companies, all the big packing-houses, the cattle loan companies, stockyard banks, rendering works, and similar institutions found at stockyards, are owned and controlled by four or five individuals ; and as these stockyards are what establish the price of live-stock in the United States, it follows quite naturally that these few individuals who own these institutions are in a position to control. For a number of years these individuals—and it is no harm to mention their names, for they are so familiar to all of us that they come into our minds immediately, namely, Armour, Swift, Morris, Cudahy—were satisfied with the packing-house business, and limited their operations to slaughtering and selling meat animals and their products ; however, within the past dozen years they have been acquiring the stockyard companies, establishing cattle loan companies, and other market enterprises that, as a matter of fact, are distinct and separate from the slaughtering business. They own stockyards at Kansas City, South Omaha, East St. Louis, St. Joseph, Sioux City, St. Paul, Oklahoma, Fort Worth, Portland and Denver.

" ' It seems reasonable that the company buying your product on the open market should not be the owner of the facilities you use to prepare the same for its purchase ; or that the man who sells your product should not be indebted and under obligations to the man who buys it ; or that a stockman who borrows money should not borrow money for feeding from the man he must sell to.

" ' For controlling prices and increasing the power of price-making, the ownership of a stockyard by a packing-house is one of the most complete means.

" ' If the owners of the yard company are the same people who buy the cattle every day from the commission company, and who finance the commission firm through a cattle-loan company or bank, the situation becomes very different, for the commission merchant must be on good terms with the people who buy from him, and he fears if he is not friendly with them that they may discriminate against him.

" ' This is just an explanation of one situation that to-day exists at most of the markets in the United States, and it is realised not only by the commission men and buyers in the

yards, but it is understood by the stockmen, and it is becoming intolerable.'

"The principal remedies which have been advanced and advocated for the improvement of these conditions were summarised by Mr. T. W. Tomlinson, Secretary of the American National Live Stock Association, at the above-mentioned hearing, as follows :—

" ' (1) A more even distribution of receipts on five days of the week. This would prevent delays at terminals, and enable the business to be transacted at less expense.

" ' (2) A weekly publication by the Government of data as to the meat supply on hand.

" ' (3) The establishment of public abattoirs in connection with public stockyards.

" ' (4) Slaughterers to relinquish, as far as possible, their interest in and control of stockyards, and other instrumentalities involved in the marketing of live-stock.

" ' (5) Commission houses not to serve as both seller and buyer of the same stock, and to sell direct to country purchasers.

" ' (6) FEDERAL AND STATE SUPERVISION OF THE METHODS AND PRACTICES AT THE CENTRAL MARKETS.

" ' (7) A GREATER CO-OPERATION TOWARDS THE END OF SECURING UNRESTRICTED COMPETITION.' "

IMPROVING POWER OF THE SHORTHORN

An excellent article by Mr. W. R. Goodwin was published recently in the *Shorthorn World* on the "Improving Power of the Shorthorn." This applies to all native stock everywhere.

Says Mr. Goodwin : The student of beef cattle breeding will conclude that the Shorthorn is not only the cosmopolitan breed, but also the universal improver of beef stocks. This fact carries a tribute and imposes an obligation. (In some countries the Hereford, Angus and Devon will be found more suitable ; it greatly depends on rainfall and condition of country and pasture.) Native stocks lack beef form—that form which in the feed lots of the world has been proved to grow rapidly, thrive easily and produce the desirable cuts of beef in the greatest proportion to wastes. Scale, thrift, and

wide and level form are the requisites of a profitable beef producer. The grower must have weight at the finish, the packer must have flesh that will cut profitably. The founders of the Shorthorn breed lived close to the pasture, the feed-lot and the butcher, evolving in their ideals a type that met the dual requirements of the producer and the purveyor of prime beef. Wherever the blood touches native stocks it instantly registers its leavening influence, and the unimproved, the scrub, becomes a visibly homogeneous part of the great tribe of thrifty beef makers that wears the colours of red, white and roan. The appeal can be made world-wide and ever is it answered in unison. The cosmopolitan character of the breed is proved in its distribution that ranges more widely than that of any other improved race of cattle, and its power of universal betterment is registered on all stocks of whatever origin or type it touches.

The first cross tells the tale. The Shorthorn bull brands indelibly his offspring in size, levelness, feeding quality. The history of cattle improvement, on whatever continent it is studied, proves the vital influence of Shorthorn blood in its foundation-laying first cross. On that foundation other breeds have built, to the great satisfaction of breeders who have skilfully crossed and carefully grazed and fed, and these breeders, wide-visioned, broad-gauged, fair-minded men, right cheerfully accord credit to the Shorthorn breed for its foundation work.

No breed has so essentially earned the title of the universal improver of native stocks as the Shorthorn. The blood of this breed is "first aid to the injured," blending kindly and effectively for the elimination of the undesirable characteristics of the primitive types, and adding size, framework, levelness of flesh and aptitude to fatten. Long years has the Shorthorn breed held this honoured position, from which it will not be displaced by any other breed while native stocks of any country or clime require the union of blood which will lay the foundation for profitable feeding. It is a place of pride and a position of responsibility.

The obligation laid on the breed is no less conspicuous, indeed it is all the more inexorable because of the unchallenged

success of the breed in the work of improvement. The wide-rolling, richly grassed ranges of America's western regions have produced and fattened the beef of the past quarter of a century. Some of it has been finished in the rich central valleys ; much of it has been grown on the grasses of the plains. In the development of this land vital changes are of almost constant record. With the transformation of open range to fenced pastures and thence to farms, all in touch with the industry are familiar. The country suddenly awakened and found itself short of beef.

Time was when the farm cow of America supplied the beef and the milk, and that cow was of Shorthorn blood. The advance in food values and the competition of the range herds, which laid down calves off free grass at central markets at prices with which farm-raised calves could not compete, drove the cows that bred feed-lot calves largely from the farms of the central west. A cow could not be kept for the value of her feedyard progeny. Farmers drifted with the tide, which has now receded and left many of them aground.

Conditions have changed back again. Augmented population, coupled with decreased beef supplies from the ranges, opens the door to profitable farm breeding of beef calves. This may be done on the cheaper, rough and broken lands with a purely beef cow, but it is readily accomplished on the richer lands of higher value with the real farmer's cow, the cow that more than pays her way at the pail while producing a prime feed-lot prospect. That cow has been, still is, and will continue to be the Shorthorn dual-purpose cow, unless the obligation which lies at the door of the Shorthorn Association and Shorthorn breeders is deliberately shirked. It may have been overlooked in times past. Men of great faith kept the fires burning on the original altars, however, conscious and confident that over vast stretches of our farming country the dual-purpose cow had her place despite the competition from the open ranges, and convinced that the day would come when a great light would shine on the understanding of American farmers, and they would turn eagerly to the big, level-framed, placid-eyed red, white or roan cow, possessed of the dual capacity for milk and meat production, according to her

Grand Champion Hereford Bull, Repeater 7th, 1915 (U.S.A.)
Owned by Messrs. O. Harris and Son.

development and education, and standing as a foundation stone of profitable American agriculture. The obligation to restore that cow to her place of prime importance in profitable small farm production rests on adherents of the Shorthorn breed. It never more insistently demanded recognition than in this time of world-throes, and in the coming period when the back of mankind will be bent under the burden of a torn world's restoration.

BREEDS OF BEEF CATTLE IN THE UNITED STATES

Shorthorns

The decrease in the number of beef animals in the United States, with the resulting high prices which have prevailed during recent years, has caused greater interest to be taken in this industry, and many men who have never raised beef cattle in the past are taking up this line of work.

The breeds of beef cattle in the United States are the Shorthorn, Polled Durham, Hereford, Aberdeen-Angus and Galloway. Each of these breeds has been carefully developed for a long period of years, with the result that individuals transmit their characters very readily when bred to native or scrub cattle.

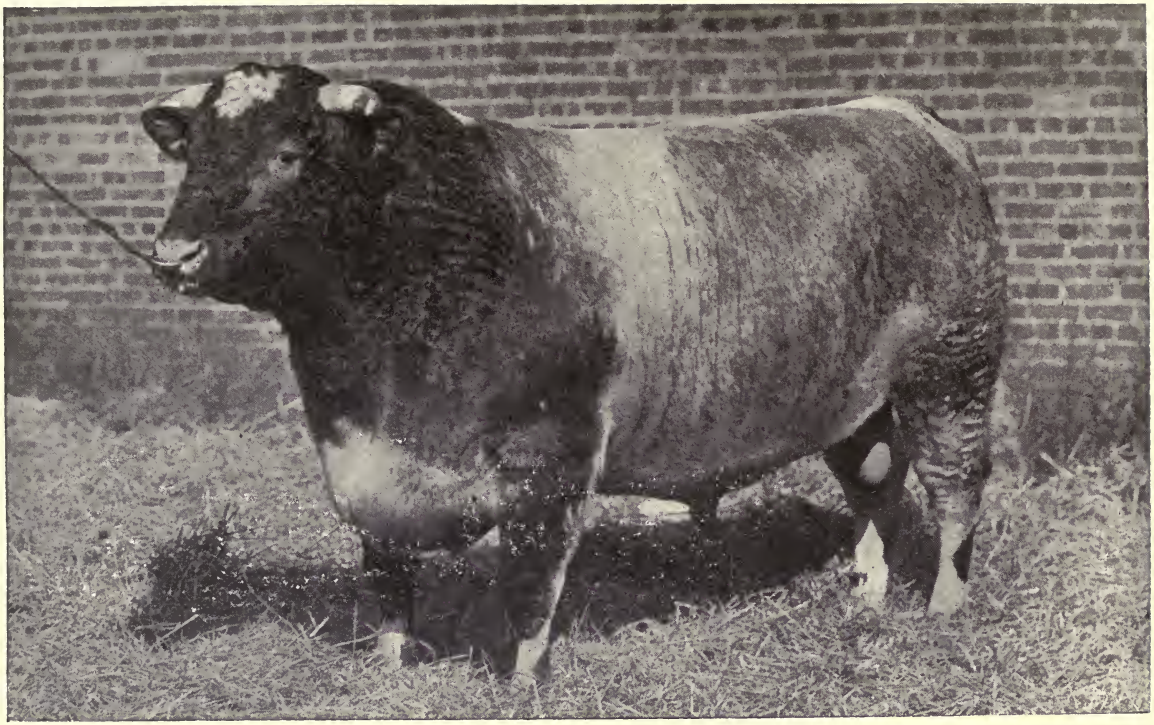
The Shorthorn is the most popular of the beef breeds in the United States, as shown by their numbers and by their general distribution over all parts of the country. They have a great range of adaptability and do well everywhere. The milking qualities, combined with the high standard as a beef animal and the gentle disposition, have caused the Shorthorn cow to be termed "the farmer's cow" in the United States. The merit of the breed has been proved on the ranges of the west, where the bulls have been used for grading up the scrub cattle of the plains. The Shorthorn crosses well with other breeds or with the scrub cattle, producing from scrub cows calves which develop into fairly desirable beef cattle. The grazing ability of the Shorthorn is not so good as that of some of the other breeds, but where grasses are abundant and feeds are plentiful there is no breed which will surpass it for beef pro-

duction. The large milk flow insures a good calf. However, the cows have been criticised to a certain extent by western ranchmen because the large milk flow causes many of them to lose a teat or a portion of the udder, as the calves cannot always take all of the milk. The steers sell readily as feeders, and although they have not won as readily as the Aberdeen-Angus in the show ring, they produce very high-class beef, with the thick loin and full hindquarter which furnish profitable cuts.

The three important strains of Shorthorn cattle have been the Booth, the Bates, and the Scotch tribes. The Booth and Scotch strains represent the true beef type of Shorthorns, while the Bates approaches the dual-purpose type. Bulls attain a weight of 1800 to 2200 pounds or more, while the mature cows usually weigh from 1300 to 1600 pounds when raised under favourable conditions. Greater weight in both cows and bulls is not rare, but extremely heavy animals are not especially desired.

Mr. W. F. Ward, Senior Animal Husbandman in Beef Cattle Investigations, U.S.A., in a pamphlet issued to farmers, says :—

"In conformation, the Shorthorn is of the true beef type, being wide, deep, lengthy, and thickly fleshed. The great width of the Shorthorns, combined with their depth, gives them a more rectangular form than any of the other breeds, while the wide variation in the distribution of the breed has caused a slightly greater difference in type to be recognised than in other beef breeds. In the cow the following points should be noted : The horn is usually small and curved forward, with the tips pointing inward, upward, or sometimes downward, and they should be of a waxy, yellowish colour. The head should be shapely, with great width between the eyes, short from the eyes to the muzzle, which should be large and flesh-coloured, with large nostrils ; a black muzzle is objectionable to most breeders. The neck should be short and full, blending well into head and shoulder. The shoulders should be smooth and well covered with flesh, the crops should be full, the heart girth should be large, and the fore flank low. The chest should be wide and deep, with the brisket thick and well to the front. The ribs are usually well sprung and the



GRAND CHAMPION (U.S.A.) SHORTHORN BULL, 1915, PRIDE OF ALBION
Owned by Mr. F. A. Edwards, Tiffin, Ohio.

barrel well developed. In good individuals the back is broad and the loin is wide, deep and thickly fleshed. The hips are wide and should be well covered with flesh ; the rump is long, wide, and level, carrying an abundance of flesh. The hindquarter is better developed in the Shorthorn than in any other breed ; it is characteristic in that it is almost straight from the root of the tail to the hocks, and is wide and thick, carrying the flesh well down, thus giving a maximum amount of flesh. The flank is low, the udder is usually well developed, extending well forward, with prominent milk veins. The teats are of medium size.

" The bull should possess the same desirable features as the female, without her feminine qualities. He should show masculinity by developing a heavier horn, a larger and thicker neck, a heavier bone throughout, and greater depth, thickness and scale. His horns are straighter and heavier than the cow's, but they should not show coarseness.

" The Shorthorn has sometimes been criticised because of poor development or lack of fulness in the crops, a high fore flank and a poorly developed heart girth. They are sometimes rather leggy, although animals of Scotch breeding are usually thick fleshed and low set. There has been a tendency to patchiness near the root of the tail and to rolls on the sides, but the breed is improving in this respect in that the animals are becoming more smooth."

The American Shorthorn Breeders' Association considers that the ten bulls which have probably done most for the improvement of Shorthorn cattle as a breed in the last fifteen years are as follows : Whitehall Sultan 163573, Choice Goods 186802, Cumberland's Last 229822, Avondale 245144, March Knight 188105, Villager 295884, Cumberland 118578, Merry Hampton 132572, Lord Banff 150718 and Whitehall Marshall 209776. The most popular families of Shorthorns in the United States at the present time are Augustas, Missies, Victorias, Duchess of Glosters and Orange Blossoms.

The Polled Durham is a Polled Shorthorn. There are two general divisions of this breed, the " single standard " and the " double standard." The single-standard Polled Durhams were produced by breeding " muley " cows to Shorthorn bulls,

selecting the polled offspring and breeding these to other Shorthorn bulls. This grading up was continued until the polled offspring was brought to the fifth cross which contained 96⅞ per cent or more of Shorthorn blood, and which qualified for entry in the Polled Durham herd book. The resulting progeny resembled the Shorthorns, but were rather leggy, lacked a thick smooth covering of flesh, and inclined more to the dual-purpose type of animals. These cattle could be registered in the Polled Durham herd book, but were not eligible for registration in the American Shorthorn herd book.

The double-standard Polled Durhams were secured by using purebred Shorthorn cows that were either natural muley or had undeveloped horns, for breeding to Shorthorn bulls. The double-standard Polled Durhams are purebred Shorthorns, and can be registered in either the Shorthorn or the Polled Durham herd books. The double-standard Polled Durhams were bred chiefly from the Gwynne, White Rose and Young Phyllis families of Shorthorns.

This breed is similar to the Shorthorn in every way except that it is hornless. It is a comparatively new breed of cattle, and has not become so popular as the older breeds, but it is increasing in popularity. They will do well under the same conditions which favour the production of good Shorthorns. Some breeders have developed the dual-purpose qualities in the animals, with the result that there is considerable variation in type.

The Hereford

The Hereford ranks next to the Shorthorn in numbers in the United States of America. Their popularity is constantly increasing, especially where cattle are raised under range or adverse conditions. As a " rustler " the Hereford is surpassed by no breed of beef cattle, and they have been recognised as responding readily to a favourable environment as well as being able to thrive under adverse conditions where other breeds would not do so well. On scant pastures and on the range where waterholes are far apart the Hereford has shown its merit. The bulls are active, vigorous, prepotent and very sure breeders.

Formerly, the Hereford was severely criticised because of a light hindquarter, but the breed has improved wonderfully in overcoming this defect during the last two decades. It is now somewhat less rangy, more compact, and heavier fleshed than formerly. The Hereford cows have also been criticised because of their scanty milk flow, but they usually produce enough to raise a good calf. The Hereford of the States has a fuller heart girth, stronger constitution, and can withstand adverse conditions better than the Shorthorn. They are early maturing, and fatten readily in the feed-lot.

The weight of the Hereford is practically the same as that of the Shorthorn. Mature bulls weigh from 1800 to 2200 lbs. or more, while good cows weigh from 1200 to 1600 lbs., although it is not unusual for mature animals of either sex to weigh more than stated.

Mr. W. F. Ward, Senior Animal Husbandman in Beef Cattle Investigations, U.S.A., says :—

" In colour the Hereford is red with white markings. The white markings usually consist of a white face and head, the white extending along the top of the neck and shoulders, a white throat and dewlap, and white on the underline. Frequently, however, no white is found on the neck or top of shoulders. White is sometimes found on other parts of the body ; and, while it is permissible, it is not desirable. A pure white face is usually preferred, although many purebred animals show spots about the face and especially some red around the eyes. The red colour of the body varies from a light red approaching yellow in colour to a very dark red approaching black. Neither the light red nor the blackish red colour is desirable, a rich deep red being the most popular. The hair is usually of medium length with a curly tendency, although short-haired animals are common.

" The general formation of the Hereford is the same as that of the Shorthorn, except that the rectangular form is not quite so pronounced and the prominent bones are more smoothly covered. The form is low, compact, and blocky, with well-sprung ribs, broad loin, and wide hips, without the prominent hip bones of the Shorthorn, and with a more rounded and bulging quarter, although developed to a lesser degree in this

respect than the Aberdeen-Angus. The head is broad and short, with large nostrils, and large muzzle and mouth, which are indications of a good feeder. The horn is longer and somewhat coarser than the Shorthorn, white in colour with waxy tips, and curves outward, upward, and backward, or outward and forward and occasionally they are drooping. The horns of the bull are straighter and heavier, and usually grow outward, frequently growing forward, backward, or downward, but seldom growing upward. The neck is short, thick, and blends well with the shoulder. Great width, depth, and length of chest and a fulness of the crops give the Herefords their constitution and endurance, which the breeders have been careful to preserve. The loin is full and deep, and the rump and hindquarter are usually well developed, carrying a large amount of flesh. This portion of the body has been greatly improved within recent years, and the tendency to roughness and patchiness has been reduced until the breed now stands out as one showing extreme beef type, with smoothness of form and much quality. For these reasons, combined with their rustling abilities, the Hereford has become the most popular breed for improving range stock. The effect of using Hereford bulls for this purpose has had a great attraction for cattlemen in the south-west, especially in the Panhandle region of Texas."

The Herefords do well in the southern States, as the heat there seems to bother them no more than it does in the corn belt. They seem to be especially adapted for use on the larger plantations, where animals are not given extremely good care, and where the production of beef alone is desired. Two or three crosses on the native stock of the south produce a good beef animal that matures early and fattens out well. On plantations especially, or on farms with only fairly good pastures, the Hereford will give better results than the Shorthorn.

The American Hereford Cattle Breeders' Association mentions the following as some of the bulls which have been most influential in improving the Hereford breed in the last fifteen years : Perfection Fairfax, Beau Donald, Beau Brummel, Corrector, Disturber, Bonnie Brae 8th, Perfection, March On 6th, Prime Lad, and Repeater.

Polled Herefords

The Polled Hereford is a new breed developed by selecting and breeding Herefords which showed polled characteristics. The double-standard Polled Herefords are purebred Herefords which are hornless and are eligible to registry in either the American Hereford herd book or the American Polled Hereford record. They differ in no way from the Hereford except that they have no horns. The polled feature has been well fixed, and the bulls when mated with native cattle sire few calves having either long scurs or horns.

Aberdeen-Angus

Aberdeen-Angus cattle are solid black in colour, and have no horns. These characteristics are so strongly developed that a bull, when bred to horned cows of various colours, will usually produce calves of which 85 per cent or more are black in colour and hornless. Occasionally a red animal is found in this breed, but the colour is not popular among breeders. Although the Aberdeen-Angus is an old breed, it is only within recent years that it has been so popular in the United States. While they are good rustlers, they have never been as popular on the ranges of the west as either the Hereford or the Shorthorn. They stand next to the Hereford and above the Shorthorn as graziers on scanty pastures. This breed is extremely valuable for grading up native cattle, but they have been criticised to a certain extent by rangemen because they do not get a greater percentage of calves. This has usually been true where they have been in a herd with horned bulls. If all the bulls were either polled or dehorned there would doubtless be less ground for this criticism. The milking qualities of the cows are only fair ; they give more milk than the Hereford, but not as much as the Shorthorn. A sufficient quantity of milk is produced to raise a good calf.

This breed is very early maturing, and has a tendency to fatten well at any age, hence their popularity for producing baby beef. In general form they are different from the Shorthorn and Hereford. The body is more cylindrical in shape,

and they are smoother throughout than either of the breeds named. The Angus responds quickly to good treatment, and, because of its readiness to fatten, early maturity, exceptional vigour, high quality, general smoothness and uniformity, and the high percentage of valuable meat produced, it is the most popular of all beef breeds among cattle feeders. They usually dress out a higher percentage of marketable meat than any other breed, and their merit has been shown by the repeated winnings they have made in the show-ring and on the block.

They stand either heat or cold well, and are popular in the south as well as in the corn belt. Because of their reputation for finishing smoothly and killing out well they are very popular in the corn belt and neighbouring states, where much feeding is done. They are becoming more favoured in the south, and rank next to the Hereford and above the Shorthorn in their general adaptability to average southern conditions.

Mr. W. F. Ward says: "The head of the Angus shows a sharp tapered poll, great breadth between the eyes, a prominent forehead, prominent eyes, a nose of medium length, a large mouth and muzzle, and large nostrils. They are more restless or nervous than the Shorthorn. The neck is short, full, and has a well-developed crest in the bull, but it does not always blend smoothly with the shoulders, which are sometimes a little prominent. The chest shows great depth, width and length. The body is cylindrical in shape, and does not show the squareness or blockiness of the Shorthorn and the Hereford, but is noted for its compactness and good covering of flesh. The ribs are well sprung, curved, and long, giving the cylindrical form to the body. The loin and rump are well fleshed and deeply covered, but entirely different in shape from the Shorthorn, as the great width and squareness are absent. The deep covering of flesh of the rump, the smallness of bone, and the deep rounding, bulging hindquarter gives a maximum amount of meat. Note the difference in the hindquarter of the Angus and the Shorthorn. The latter is broad and straight from pin bones to the hock, while the Aberdeen-Angus has less breadth and a very rounded bulging quarter with a deep twist. The Angus is not so low in the flank as

the Shorthorn, and some individuals are light in the hind-quarter.

"The quality of the animal is unsurpassed, as shown by the soft, pliable, mellow skin and fine hair. The meat is fine-grained and of the highest quality. The constitution and vigour of this breed as indicated by well-developed chest and good heart girth are worthy of mention. For grading up native stock and for crossing, they hold an enviable record."

The Galloway

The Galloway is one of the oldest breeds of cattle. They are polled, solid black in colour, though occasionally some brown is shown, and have a long, curly, silky coat. This breed is very prepotent, and transmits the black colour and polled characteristics readily to offspring from cows of any colour. As high as 90 per cent of the calves from various-coloured cows are black, and from 95 to 99 per cent of the offspring from horned cows are polled. This breed is slow maturing when compared with the Aberdeen-Angus or the Hereford. In size they are smaller than any of the other beef breeds. Mature bulls usually weigh from 1700 to 1900 lbs., while the mature cows weigh from 1000 to 1300 lbs. each.

These cattle are exceedingly good rustlers, not being excelled by any other beef breed in this respect, and their long silky coat of hair enables them to stand severe weather with little discomfort. For these reasons they have proved to be very valuable on some of the ranges of the north-west and of Canada. They do not respond so readily to good treatment and to plenty of feed as do the other breeds, and have therefore not become popular in the corn-belt States.

In form they are low set and deep, but are proportionately longer than the Aberdeen-Angus and flatter of rib. The head is somewhat similar to that of the Angus, except that the poll is not so sharp. The head is covered with long wavy hair, and the ear is set farther back from the forehead. The body is long and of medium depth. The rump is long and well filled, although the tail head is usually set rather high. The hind-quarter is usually good, being full, similar to that of the Angus.

The bone is fine, the skin mellow, the hair soft and silky, and the grain of the meat is fine and high in quality. Little attention has been devoted to the milking qualities of Galloway cows, but they give enough milk to raise a good calf. The milk is regarded as ranking high in butter-fat, and having good quality. The Galloways have commanded especial attention because of their prepotency and the uniformity of the offspring when the bulls are used for grading up or for crossing.

This breed will probably never be very popular in the United States except in the north-west, where climatic conditions are severe and the range grasses are often scant. In that section, however, the bulls could be used advantageously for grading up native stock.

DUAL-PURPOSE BREEDS

The dual-purpose cattle have been bred to produce females which would yield a good quantity of milk and produce offspring which would be desirable for beef. As the type of animal necessary for the production of large yields of milk is entirely different from that of the beef animals, it has been impossible to produce a breed which would combine these functions and be of superior merit for both purposes. The dual-purpose animal may, however, be a desirable milker and at the same time produce calves which make good, though not superior, beef animals. As there has been a constant tendency for some breeders to incline more to the dairy type of animals, while others prefer to develop the beef tendencies, there has been, and probably always will be, a wide variation in the type of dual-purpose animals. They are not so uniform in conformation as either the strictly beef or dairy breeds. Most breeders prefer to use cows which approach the dairy type nearer than the beef type and to use a bull of the beef type that had a dam with a good milk record. The offspring of such cattle necessarily cannot be of as uniform type as the breeds which have but one function to perform.

The dual-purpose cattle are popular with the small farmer, who keeps but a few cattle, and must depend upon them to produce all the milk and butter needed for the family, and at

the same time raise calves or steers which will sell readily for slaughter purposes. They have not been popular with the ranchman or farmer who raises large numbers of cattle.

The principal dual-purpose breeds in the United States are certain types of the Shorthorn, together with the Red Polls and Devons.

Shorthorns

The dual-purpose Shorthorn is more popular than any of the other dual-purpose breeds. They respond readily to good treatment, and have become exceedingly popular with the small farmer. Formerly these cattle were almost entirely of the Bates strain, but at the present time many of them contain considerable Scotch blood. As a breed they are the same as the beef-bred Shorthorns, except that the beefy tendency is not so strongly emphasised. The milking qualities have been developed, and the cows have a conformation approaching the regular dual-purpose form, being longer of limb, higher in flank, larger in barrel, and thinner in hams than the beef Shorthorns. The bulls approach the beef type more than the cows, but are lighter in the hindquarter and a little higher in flank and not so heavily fleshed as the strictly beef type. The udder extends high up in the back and well forward, the milk veins are usually very prominent, and the teats are medium to large in size and are well set. Calves from the cows by a well-fleshed bull usually grow and fatten well and make a good quality of beef.

Red Polls

The Red-Polled cattle originated in England, and were introduced into the U.S.A. in 1873, but few importations were made until about 1885. Since that time many have been imported. This is strictly a dual-purpose breed, and approaches the ideal of the dual-purpose type. In size they are smaller than the beef breeds, and have not the thick covering of flesh. Mature bulls weigh from 1700 to 2100 lbs. or more, and the cows from 1100 to 1350 lbs. or more. Occasionally very heavy individuals are found, but these are the exception and not the rule.

The cattle of this breed are fair grazers, ranking with or slightly ahead of the Shorthorns but not equal to the Devon or Hereford. They are very prepotent and give uniformity in offspring when bred to native cows. Like all dual-purpose breeds, it has been hard to fix or to hold a uniform type, as many breeders incline to beef production, while others try to develop the milking qualities to the detriment of the beef form.

The breed has long been celebrated for its early maturity, easy fleshing qualities, and for a fair to good milk flow. The steers have attracted attention and sold for high prices on English markets for years, and have made very creditable showings in America. They make good daily gains and lay on flesh evenly. They are usually rather leggy, and lack the heavy fleshing qualities of the beef breeds. The hindquarters are less well-developed, with a tendency toward a rather thin thigh and a high flank and twist.

The milking qualities of the breed are fair. Many of the cows average over 5000 lbs. of milk a year. The cows flesh up readily when dry.

In conformation these cattle resemble the Devon. The head is lean, medium in length, with a well-defined poll, covered with a nice tuft of hair of medium length. The neck is longer and thinner than in the beef breeds, and does not blend with the shoulders so nicely. The chest is unusually well developed and the ribs well sprung, though lacking in a thick covering of flesh. The barrel is developed to a greater extent than with the beef breeds, and the loin and hindquarter are lighter fleshed. The bone is of medium size. The skin is thin, soft, and pliable, and the hair is short and fine, showing quality. The colour ranges from light red to dark red, but a deep, rich red is preferred throughout, although a little white on the udder or underline and a white brush are permissible. The udder is well developed in the back, but does not come forward well; it is "chopped off," and the tendency is to develop large teats. The milk veins are prominent and of fair size.

The Red Polls are more nervous than the Shorthorn, but less so than the Aberdeen-Angus. As this is a comparatively young breed, they are not so popular as the older breeds. As dual-purpose cattle they are hard to excel.

Devons

Devons, one of the oldest breeds of cattle, were introduced into the United States at an early date, and became popular in New England and in parts of Virginia nearly a century ago. The cows were good milkers, and the steers were used as work oxen or for beef, and filled either place admirably. They are exceedingly good rustlers, are vigorous, hardy, withstand both heat and cold well, and are very prepotent. For these reasons they were popular with the people of New England. They are slower of growth than any of the beef breeds except the Galloway. Their endurance, intelligence, and their gameness have made them popular as work oxen wherever they have been tried—no breed excels them in this respect.

In size they are somewhat smaller than the Red Polled, mature bulls weighing from 1500 to 2000, and cows from 1100 to 1400 pounds or more. They are solid red in colour, white being permitted only on the udder, or near the scrotum of the male, and on the switch of the tail. The shade of red varies, but a rich bright red is preferred. In conformation the Devons incline more to the beef type than to the dual-purpose type. They are close coupled, very compact, smooth, and rank high in quality and style. They have small bone, which is hard and compact, giving a slender, fine leg.

The head is lean, clean cut, of medium length, and surmounted by rather long white or waxy horns, which curve upward, forward, outward, and backward in the cow, and are almost straight in the bull. The horns of the steers are large, long, and often widespread, usually being very white or waxy, with dark tips. The neck is medium in length, smooth, and blends nicely with the shoulder. The body is compact, fairly well covered with flesh, has well-sprung, deep ribs, and is usually low set. The chest, back, loin, and hindquarter are usually well developed, though the flank and twist are usually somewhat higher than in the beef breeds. The cows are fair to good milkers, giving rich milk, and always provide an abundance to bring forward a good calf. The steers fatten somewhat slower than the beef breeds, but produce meat fine in

texture and of good quality. The breed cannot be surpassed as good feeders, but they are usually slower in growth than the beef breeds, and this alone can account for the fact that they have never become popular throughout the country. In New England, in parts of the south, and in a few other States the Devon has proved profitable, especially on lands where the grazing was rather scant or of poor quality. They are prepotent; good calves are produced when good bulls are mated with common cows, and such calves usually make fair milkers.

Brahman or "Indian" Cattle

Under the names of "Brahman," "Indian," or "Zebu" cattle are classified a number of different strains of cattle of the species *Bos indicus*. Some of these strains vary so in type, colour, size and habitat that they are classified as separate breeds. The most important breeds of these cattle are the Krishna Valley and Hissar. These cattle are classed as dual-purpose animals, as many of the females give a good quantity of milk. They are used quite generally in India as milch cows, and are more satisfactory than any other breed of cattle under the severe conditions of drought, heat, insect enemies, etc.

As these cattle have been raised for more than three thousand years in a hot climate, they are only suitable for warm country. Although they are of a different species from our common breeds of cattle, they cross readily with them. The females of this breed carry their calves somewhat longer than other cattle, the period of gestation being about three hundred days.

The oil secreted by the sebaceous glands of the skin is of a peculiar odour and gives the skin a soft, oily feeling. This peculiarity, combined with the scant covering of hair and the extremely tough hide, affords these animals considerable protection from ticks, mosquitoes, etc. Cattle ticks do not bother the purebred cattle at all, and few of the half-breeds become infested to any appreciable extent.

These cattle stand the heat well, and have great endurance, moving readily in a fast walk or trot. They make the best

of work steers if handled constantly by one driver, but they have a nervous disposition, and give considerable trouble where the drivers are frequently changed. They are more nervous than any of our breeds of cattle. When raised in small herds and handled constantly they are quite docile, but if handled under range conditions they become very wild, and stampede or fight readily. The quality of the beef from these animals or from grade Brahmans is slightly inferior to that of either the beef breeds or the dual-purpose cattle, but they dress out a high percentage of meat.

In size the bulls range from 1500 to 1800 pounds, and many of them attain a height of 6 ft., while the cows usually weigh from 1100 to 1400 pounds. The various strains of these cattle have different colours, although each strain has a fixed colour. The colours are pure white or a creamy white, silvery grey, red, and dark brown approaching black. The silver-grey, with dark fawn on shoulders and neck, and the creamy white, are the most popular colours. Many of the animals have brindle stripes on the body.

The chief characteristics of the breed are the large hump on the withers, the large loose folds of skin forming the dewlap and the navel, and the long, drooping, pendulous ears. The head is also characteristic of this breed, as it is long, with a forehead which recedes from the eyes to the horns, while the bones forming the brow are prominent. The head tapers gradually from the eyes to the nostrils, the horns are dark, short, straight, heavy at the base, and point upward and backward. The ears are very long, drooping, and are thin and oily, frequently being almost devoid of hair. The eye is mild and sleepy, but changes quickly when the animal is aroused. The neck is of medium length and has heavy folds of skin forming an over-developed dewlap with fulness at the throttle. The body is deep but rather narrow, the hips are long, sloping, and narrow, and the rump often droops toward the tail. The legs are long, tapering, and show a strong bone free from coarseness. A very heavy sheath is developed, and in old bulls often hangs 9 in. or more below the belly. The hump is large in the males, attaining a height of 12 to 16 inches, but is not so well developed in the females. The half-bred

males may have a moderately developed hump, but the half-bred females have none. Animals which contain as little as one-sixteenth Brahman blood usually show some Brahman characteristics, especially in the shape of the head and the loose folds of skin forming dewlap and navel.

THE BAILIFF'S HOUSE AT LORD ROTHSCHILD'S, TRING, ENGLAND, WITH A GROUP OF RED POLLS

CANADA

CANADIAN farmers are making strenuous efforts to augment their meat supplies, the number of cattle in 1917 being about 8,000,000, against 6,600,000 in 1916—an increase of 20 per cent. Sheep also increased from 2,022,941 in 1916 to 2,369,358 in 1917. The Government is assisting the farmers in every way to increase their live-stock.

The Hon. Martin Burrell (Minister of Agriculture), in a statement issued recently, outlines a co-operative plan reached between the Department and the Canadian railways. The aim of the scheme is to prevent depletion of Canadian breeding and feeding stock, insure the feeding of live-stock in Canada, and to secure the return of feeding and breeding-stock to the farms. It comprises :—

A redistribution policy, which will provide for the movement of stock from areas where feed is light to areas where feed is plentiful.

Free freight policy in connection with the transportation of breeding cattle and breeding sheep.

Fifty per cent rebate of the freight rate on car-load shipments of feeding cattle from Winnipeg to country points in the eastern provinces.

Free shipments of car-loads of breeding sheep and lambs from Toronto and Montreal to the West. Just imagine a proposal such as this on the State-owned railways of Australia, where stud stock are more heavily freighted than fat stock when being conveyed. The "democratic" population of the big cities would at once raise a cry that the farmers were being favoured, instead of having brains to understand that the more the producer is assisted, the better it must be for the consumer.

The Government of New Brunswick (Canada), through its Department of Agriculture, is giving publicity to a proposal

formulated under recent legislation by which it is hoped the pastoralists of the Province will be encouraged to devote more attention to sheep than has been done in the past. Briefly, the Government's proposal is this : through an arrangement made with the chartered banks, assistance will be given where it is needed to all farmers to buy sheep. The Department of Agriculture will not only arrange to buy sheep for the farmers, but will also buy from the farmers any good breeding stock that may be available. If a farmer needs credit, he may consult a local banker, and from him obtain the necessary forms. If sheep are not to be had in any given locality, a farmer there resident will be given an opportunity to purchase through the banks and the Agricultural Department in another part of the Province.

The Canadian Minister of Agriculture, in a pamphlet dealing with beef-raising, says : " Canada recognises that to succeed in the production of beef the requirements of the purchaser must be complied with. The standard of the beef market has changed greatly in recent years. Not many years ago the best market demanded large, heavy, thick bullocks weighing 1800 to 2000 lb., but the demand has changed, and cattle of that description are no longer in demand. The bullock that commands the highest price is a compact, well-finished animal weighing not more than 1500 lb. on foot, and if he weighs only 1200 lb., he will command the highest market price, provided he has the form, quality and finish. Even the thousand-pound ' baby beef ' is looked for by the man with the money on this side of the Atlantic, but such cattle are not shipped abroad. This change is greatly to the advantage of the producer, as, other things being equal, the younger the animal goes to market the less is the cost of food and the greater the profit to the producer.

Quality and Weight of Cattle

" The British market demands cattle of moderate weights, good quality, and carrying sufficient fat in connection with the lean meat to secure a high degree of excellence without waste. To secure delicate flavour and tenderness a certain proportion of fat is necessary, and this should be incorporated with the

Range Cattle in Alberta, Canada

flesh or lean meat rather than appear only as a covering to the muscles. The great secret in producing a carcase of beef is to treat an animal in such a way that the fat grows with it during the entire period of its lifetime. It is unfortunately the too common practice of Canadian beef-raisers to produce all the fat that an animal carries in the course of a few months. Much of the fat put on it this way is deposited on the outside of the carcase ; it is largely wasted, as it is useful for little else than tallow. The carcase that dresses out showing specks and streaks of fat throughout the lean tissue commands the highest

Shorthorn Cows at Edmonton Exhibition

price. Such beef is regarded as much of a delicacy as the finest turkey or lamb. The only way to be sure of prime quality is to maintain the animal in good condition by a system of liberal feeding from birth to maturity. Then the finishing period is comparatively short, and the carcase produces the highly desirable marbled beef.

" It will be gathered that the requirements of both the feeder and the butcher must be considered in the selection or breeding of the most profitable steer. The feeder must have in his animal good bone, roomy paunch and a deep broad chest, while to the butcher's steer these parts have no particular value, because it is in these that much waste occurs. Giving

the requirements of both feeder and butcher due consideration, a standard of perfection has been built up, in which each part of the animal is afforded a numerical value according to its importance. The following score-card agreed upon by many of the foremost demonstrators and instructors in animal husbandry will be of value to students who desire to become proficient in the judging of beef cattle :—

SCORE-CARD FOR BEEF STEER

General appearance, 40.	
Weight, according to age	10
Form, straight topline and underline ; deep, broad, low set, stylish	10
Quality, firm handling, hair fine, pliable skin, dense bone, evenly fleshed	10
Condition, deep even covering of firm flesh, especially in the regions of valuable cuts	10
Head and neck, 7.	
Muzzle, broad, mouth large, jaw wide, nostrils large	1
Eyes, large, clear, placid	1
Face, short, expression quiet	1
Forehead, broad, full	1
Ears, medium size, fine texture	1
Horns, fine texture, oval, medium size	1
Neck, thick, short, throat clean	1
Forequarters, 8.	
Shoulder vein, full	2
Shoulders, covered with flesh, compact on top, smooth	2
Brisket, advanced, breast wide	1
Dewlap, skin not loose and drooping	1
Legs, straight, short ; arm full, shank fine, smooth	2
Body, 32.	
Chest, full, deep, wide, girth large, crops full	4
Ribs, long, arched, thickly fleshed	8
Back, broad, straight, smooth, even	10
Loin, thick, broad	8
Flank, full, even with underline	2

Hindquarters, 13.

Hips, smoothly covered, distance apart in proportion with other parts	2
Rump, long, wide, even ; tail head smooth, not patchy	2
Pin bones, not prominent, far apart	1
Thighs, full, deep, wide	2
Twist, deep, plumb	2
Purse, full, indicating fleshiness	2
Legs, straight, short ; shank fine, smooth	2
Total	100

Imported Shorthorn Bull, Gainford Marquis

Making Baby Beef in Alberta

Although considerable numbers of three and even four-year-old grass-fed steers still come from the ranges of Alberta, the rapidly increasing production of grain and cultivated fodders is tending to bring about the marketing of cattle at a much earlier age than was usual under the old conditions. For some years past sales of two-year-old fat steers, and, unfortunately, also heifers, have been increasing in frequency, but baby beef has until now been unknown on the Alberta market. The following brief statement of an experiment in the fattening

of last year's calves on the Canadian Pacific Railway supply farm at Strathmore should, therefore, be of interest.

Recently, forty-four steer calves, mostly of Hereford and Shorthorn breeding, which had been running with their dams from birth, were weaned and placed in feeding pens holding from eight to fifteen head, in the big barn at Strathmore. A few were March calves, but the great majority were from six to eight months old. Some were of excellent beef type and quality, but, as beyond taking the best of those which happened to be on hand, they were not specially selected, a number more or less lacking from the feeder's standpoint. Calves quite as good, or even better, are readily procurable in Alberta every fall. They averaged in weight on 23rd November slightly over 486 lbs., being scarcely as good in flesh as they would have been had the weather in October and November been more favourable than it was last year. Circumstances also prevented the carrying out of a very valuable feature in the production of baby beef, namely, the teaching of the calves to eat chop when still with their dams, thus holding the milk flesh and forestalling the check at weaning, unavoidable otherwise. Throughout the feeding period the calves had all the fodder they would eat up clean. At the beginning, a little restriction was put on the quantity of grain given, 2 lbs. per head per day being the amount started with. By the end of the first month this quantity had been more than doubled, between 6 and 7 lbs. per head per day being the grain ration from the beginning of full feed until the calves were sold. The grain mixture used at the start was two parts of oats, one part of barley, and one part of bran. About the 1st of February the barley was increased to half the ration, and the same proportion of bran continued. A small quantity of frosted flax, costing a half-penny a pound, was used after the 1st of January, a total of 60 bushels being fed from then until the end of April. All the grain required was valued at the market prices prevailing from the same at the end of October—oats at 1/11, barley 2/10½ per bushel, and bran £4/14/8 per ton. With the grinding, the grain figured to approximately ¾d. per lb. Green oat sheaves furnished the bulk of the fodder, about 2 lbs. of oat sheaves to 1 lb. of hay being the proportion. The oat sheaves were valued

Mob of Cattle, Indian Head, Canada

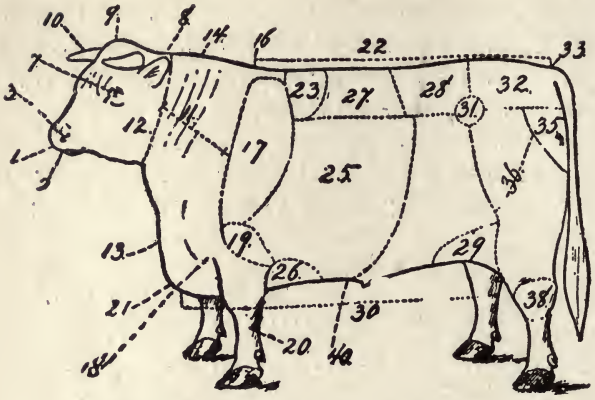
at £1/8/10 per ton in the fall, and the hay £2/13/6 per ton for alfalfa and £1/8/10 per ton for the prairie hay. The quantities used of each made the cost of the hay approximately £2/1/2 per ton. The barn was well lighted and ventilated, and water and salt were available at all times.

The price realised was 4d. per lb., with a cut of ½d. per lb. on the fifteen light calves, and 5 per cent shrinkage on the whole, as they were weighed out of the barn. This figured out as follows :—

Cost.			
44 calves, total weight 21,404 lbs.	£264	4	11
54,068 lbs. oat sheaves	38	18	9
43,680 lbs. hay	44	18	9
33,859 lbs. chop	104	10	0
6903 lbs. bran	16	6	8
	£468	19	1
Returns.			
29 calves, 24,285 lbs. at 4d.	£424	14	9
15 calves, 10,595 lbs. at 3¾d.	163	10	0
	£588	4	9
Less 5 per cent shrinkage on 34,880 lbs.	29	8	3
	£558	16	6
Deduct cost as above	468	19	1
Net profit	£89	17	5
Cost per lb. of gain, 3¾d.			

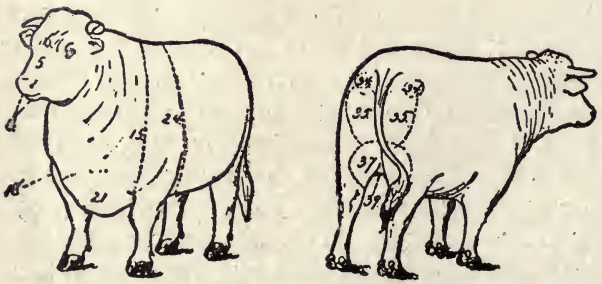
The calves were purchased and were weighed out on the 6th of May, having been 164 days on feed. Forty-four head weighed a total of 34,880 lbs., an average of over 702 lbs. The gain made by each calf averaged about 305 lbs. for the period. A lot of eight Herefords made the largest gains during the feeding. On 6th May this lot, averaging just under twelve months of age, weighed 950 lbs. each. Another lot of fifteen, averaging in age under eleven months, weighed 798 lbs. each ; a third lot of six head of the same age, 786 lbs. ; and a pen of fifteen of the youngest calves 706 lbs.

This out-turn shows a net profit of nearly £2/1/2 per head. Considering feed prices this year, this may be considered a very fair return. Under ordinary conditions, with grain worth about 3/1 per cwt. instead of 6/2, with hay at least 8/2¾ per



Points of Beef Cattle. Side View

1. Muzzle.
2. Mouth.
3. Nostril.
7. Eye.
8. Ear.
9. Poll.
10. Horn.
11. Neck.
12. Throat.
14. Top of chest, or neck.
16. Top of shoulder
17. Shoulder.
19. Point of shoulder.
19. Arm.
20. Shank.
21. Brisket.
22. Topline.
23. Crops.
25. Ribs or barrel.
26. Foreflank.
27. Back or chine.
28. Loin.
29. Hind flank.
30. Underline, or bottom line.
31. Hip, point of hip, hook bone.
32. Rump.
33. Tailhead.
35. Buttocks.
36. Thigh.
38. Hock.
40. Navel.



Points of Beef Cattle. Front and Rear Views

4. Lips.
5. Face.
6. Forehead.
15. Neck vein, or shoulder vein.
18. Point of shoulder.
21. Brisket.
24. Girth.
34. Pin bones.
35. Buttocks.
37. Twist.
39. Purse.

ton cheaper, and with the price of the finished product as high as that realised—for these calves sold at a moderate price, considering their quality and finish—there would have been a net profit of £3/9/11 per head. Careful observation of these calves during the winter confirmed the following practical conclusions, about which there is perhaps nothing very new : That feeding calves for baby beef pays even under prevailing high prices for feeds and moderate prices for beef. That the best gains are made by calves about eight months old at the beginning of the feeding period. That it pays to select the calves carefully, taking only those that carry a fair amount of natural fleshing and that have never had a set-back. That beef type and natural fleshing are the controlling factors in determining the length of time and quantity of feed required to fit a calf for the block ; calves of dairy type and calves of beef type lacking somewhat in fleshing at the start will not make gain comparable with that made by deep-fleshed, low-set, thick, blocky calves that have never had their growth checked—calves of the thin-fleshed order incline to belly-fat, and do not cover deeply with flesh on the back and loin. The last conclusion is that quietness in the food lot, gentleness in handling the calves, and careful attention to feeding regularly have nearly as much to do with the final results as has the feed.

MEXICO

The Republic of Mexico has an area of 772,652 square miles, and is roughly 800 miles from east to west at its widest point, and 2000 miles from north to south, thus being equal to New South Wales, Victoria, and South Australia, or, say, a quarter of federated Australia.

Mexico has about 6,000,000 cattle and 4,000,000 sheep, and with its great advantages in railway communications with its great northern neighbour, the United States, and its excellent shipping facilities on the Atlantic side, should, with an improvement in its quality of stock, soon become an important factor in the export of frozen meat.

There seems to be a considerable confusion in the minds of many between Mexico and New Mexico. Mexico (or, as it is generally called, Old Mexico), after the termination of the war with the United States of America in February, 1848, ceded to that Republic as war indemnity all lands north and west of the Rio Grande River ; included in this was the territory called New Mexico.

Mexico as a country has been endowed by Nature with an over-abundant supply of natural resources, rich in minerals, silver in almost every mountain, copper and lead are plentiful, gold also being found in fairly large proportions. The northern States are phenomenally rich in immense coal beds, and in the States of Durango and Nuevo Leon are found almost solid mountains of iron. Turning to the other sources of its wealth, we find large tracts of splendid agricultural and grazing lands. The formation of the country is peculiar. It rises in three distinct tablelands from the coast ; first are the hot lands (tierra caliente) near the coast, where all tropical growth is abundant in fruits and forests ; then as the land rises from 2000 to 5000 ft. above sea-level comes what is called the tem-

perate zone (tierra templada). Here it is eternal spring. Then as the land gets higher up to the Sierra Madre comes the cold belt (tierra fria), cold only in comparison with the other warmer parts, as snow is seldom seen except on the high mountain peaks, but where frosts in winter prevent the growth of the more tropical fruits and vegetables. The two latter zones are the great stock-raising portions of the Republic, healthy alike for man and beast.

The system of running stock in Mexico is very much after the old style that was in vogue in Australia fifty years ago. Sheep and goats are shepherded in flocks of from 1200 to 2000, the shepherd (pastor) has no dog to help him, but breaks in his flock to turn at certain cries ; at night he brings his flock to the camping ground (majada), and so well trained are they that wherever they see the shepherd's fire they coil down and remain till morning, unless disturbed in the night by wild animals, when it is the duty of the shepherd to get round them and bring them back to their camping ground, the coyote (wild dog) being most troublesome. The shepherd has no tent or hut, merely a piece of oilcloth to sleep on or to keep his provisions dry ; hence the shifting of camp is an easy matter, and a flock never remains on one camp more than a few nights—a decided advantage. Over every four shepherds there is a " vaquero " (overseer), whose duty it is to count sheep, carry water and rations to the shepherds, and look for any stray sheep. Over every four " vasieros " there is a " mayordomo " (head man) who has the general supervision over all, and issues rations, etc.

Lambing is quite a laborious undertaking. First, all ewes in lamb are carefully drafted out and run in small flocks not exceeding 1000 ; each day's lot of lambs are kept apart in small " atajos " (flocks) until the lambs are well mothered, when several of these " atajos " are joined ; the lambed flocks are never larger than 300 until the lambs are marked. All this necessitates a number of extra hands, but as labour is very cheap, from 18/– to 20/– a month, it pays to do it, and usually good percentages are raised.

Shearing is done in temporary sheds of boughs, with mother earth as a floor, swept more or less carefully (generally less) for the occasion. One of the shearers being appointed captain,

the rest bow implicitly to all his commands, and it is to him the owner of the sheep brings all complaints, such as improper shearing, etc. The shearers' tallies are kept by each man receiving a check as he releases his shorn sheep. The owner pays a lump sum on the grand total as counted out by him to the captain, who arranges with the men their individual amount. The usual price for shearing is 10/– a hundred, and the shearers find themselves. On very large ranches it is less, even as low as 8/–. Wool is packed into large sacks by the simple process of tramping it in, fleece, pieces and bellies all in one mass, these sacks averaging about 300 lbs. Shearing twice a year is universal, and it is claimed by this method fully 1½ lbs. more per sheep is obtained. Buyers usually come round at shearing and purchase delivered at nearest railway station. Scab, the sheepman's greatest curse, is still prevalent in Mexico; wherever the owners of sheep are Mexicans, they either do not realise that it can be cured or are too indolent to stamp it out by united effort; where sheep are owned by Australians, English, or Americans, the flocks are usually free from this parasite.

Goats are largely raised, as they are most prolific, and a ready sale for their carcases is always to be had at from 4/– to 5/– each, whilst their hides are shipped in immense quantities to America for shoemaking, and realise locally about 2/6 each.

By far the pleasantest branch of the stock business is in breeding cattle, and this, after goats, is the most lucrative. Formerly they were run in a haphazard style on free range, and all owners together, but now as land is being bought up and fenced, the small men with no land are being squeezed out, and gradually the cattle industry is getting into the hands of the wealthier classes. The system of working the cattle is a happy combination of the best methods of all countries; properties are bought, fenced by barbed wire, and subdivided; stockyards, tanks, and wells put down, and the more improved strains of Hereford, Durham, and Polled Angus are being introduced. The markets for fat stock are the principal cities of Mexico, Cuba, and the United States of America. It is a very healthy place for cattle. I have never seen or heard of a case of pleuro or foot-and-mouth disease, and the calvings

are usually of a high percentage, averaging over 70 per cent. Horses do very well, but there is little sale for them apart from those required for the Mexican cavalry. Mule-breeding is, however, a most lucrative business, and splendid animals are obtained by using American jacks (donkeys) of from 15 to 16 hands put to native mares. The demand is keen for mules, unbroken, three years old.

As to the price of land, it is very varied, there being, as in all countries, good, bad, and indifferent. Land that will carry a bullock to 10 acres can be bought, fenced and improved, at from 6/– to 7/– an acre, according to its location to railways or large cities. Unimproved land of about the same carrying capabilities, but further back, can be bought at from 2/– and upwards, while some parts sell as low as 6d. an acre in large tracts of poorer quality. Irrigable lands are much higher, running from £6 to £10 an acre.

The star of Mexico, as a meat exporter, is waxing, and it promises to shine still more brightly, as among the countries of the world few possess such a combination of advantages for successful stock-raising and cheap meat production. About three-fourths of the whole area is considered suitable only for grazing and agriculture, and the bulk of it is chiefly valuable for grazing. American ranchers, who have been crowded out of their own country by the encroachment of settlers and the handicap of the now almost prohibitive land values in the United States, have realised the great field awaiting them in Mexico, the richness, the vast extent, and the low cost of the splendid pastures, and so it has come to pass that enterprising men, with money and experience, have been migrating from their own country to where they can obtain land at a fifth of the price per acre that similar land would command in Texas.

Although the quality of Mexican live-stock is at present inferior to that produced by the United States and Canada, rapid progress is being made, and there is an increasing percentage of cattle suitable for export as refrigerated meat, while for the tinned-meat trade there is an ample supply. When it is borne in mind that Mexico is equal in area to the United Kingdom, France, Germany, Spain, and Portugal, and that the greater part of it can be most profitably utilised by the production of

live-stock, it can easily be seen that there are marked possibilities of a big trade. The rainfall over the greater part of the territory is sufficient to ensure the growth of nutritious grasses, and the quality of fat produced by these grasses compares favourably with the production on the prairies of Canada, the United States, and Argentina.

The Mexican National Packing Company, Limited, is about the most favoured meat company in the world. Mexico was noted as the possessor of the most faulty and out-of-date system of dealing with meat that existed in any country of equal importance, and in order to place it on a more sanitary footing, and to enable the people to be provided with wholesome meat, the Mexican Government granted the packing company very extensive and valuable concessions. The people of Mexico can now purchase clean refrigerated meat, and they can purchase it at a lower price than they formerly paid for a poorer quality of meat handled in an insanitary manner.

Taking everything into consideration, the improving quality of the cattle, the favourable climatic conditions, and the short average rail haul to the packing houses, it is tolerably certain that before long Mexico will be counted as one of the world's big meat suppliers. It only awaits a more settled government, which no doubt will come after the war, when the German influence is removed, to make this one of the most important and the closest big beef supply to the British Empire and the United States.

I shall never forget the trip I made some years ago from Vera Cruz to the City of Mexico. The railway most of the way rises five feet in every hundred, and the scenery everywhere is magnificent. At Esperanza, near the top of the range, we, as usual, broke our journey for the night, when we were banqueted by the native population. We passed en route the magnificent mountain of Orizaba, and from then on travelled over a vast grassy plateau to the capital. We were conveying big consignments of Mexican dollars to the coast for shipment, per Royal Mail steamers, to China. They were eventful and exciting journeys indeed.

VENEZUELA

This Republic is bounded on the south by Brazil, on the north by the Caribbean Sea, east by the Atlantic, British Guiana, and Brazil, and west by Colombia ; it is 700 miles north and south, and 650 miles west and east. It has a population of 2,600,000.

The area of Venezuela is variously given between 394,000 and 600,000 square miles, but the larger figure includes territory whose possession is not definitely settled, or which has only been approximately surveyed.

The great llanos or plains are a marked physical feature of Venezuela. At one time they were the home of huge herds of cattle and horses. They are covered with rich natural grass, with some wooded areas, and the general elevation above sea-level is about 400 ft. Due to the flat and uniform surface, the llanos are inundated in the rainy season from the waters of the Orinoco to the extent of thousands of square miles, or connected with a network of connecting channels.

It is a magnificent cattle-rearing country, and at the present time possesses about 2,000,000 head, mostly small and wiry. It is a country that should easily run 20,000,000. It has already exported frozen beef, and promises to increase its shipments.

The plains are thickly studded with low trees, and the Orinoco, the great water highway of Venezuela, is fringed in its lower course with magnificent evergreen forests. Venezuela is the home of the cow tree, which yields large quantities of nutritious, thick milky juice. Countless herds of cattle once were supported on the grassy llanos, but there has been a great decrease in the numbers through the murrain and other causes. The llanos or pampas occupy a fourth of the country lying between the Orinoco and the northern moun-

tains, with undulating plains of long grass broken by numerous clumps or belts of low-sized trees. It is almost unnecessary to say that the lower lying portion of Venezuela consists of unhealthy swamps with luxuriant vegetation, accompanied by tropical fevers. The llanos have the rainy season in the summer months.

In the province of Apure the pastures are abundant all the year, a great number of horses, mules and asses feeding on the plains. The most elevated part, in the province of Trujillo, has declivities with fine, well-wooded valleys, and between them several plains descending in gentle slopes, covered with fine pasture. Sheep are only numerous in the mountains and hilly tracts, cattle, horses, mules and asses being run on the plains or llanos, hence their name of cattle-plains. The greatest heat is experienced on the cattle-plains ; on that undulating country the thermometer ranges between 83 deg. and 95 deg., and the mean annual heat, 83 deg., is greater than that of the Equator at the sea-level. At the lower end of the Rio Apure the heat is intolerable during the dry season, as the north-easterly wind passes over the strongly heated surface of the tableland before it arrives at the low plains of the Apure, and thus the air feels as if it came from an oven, the same as on a " brickfielder " day in parts of Australia. The heated sand, which is suspended in the air and carried forward by whirl-winds, renders it still more disagreeable. The temperature of this part is between 86 deg. and 98 deg., the mean annual heat being 91 deg., although it is much less in those parts which are covered with forests. There the mean temperature is only about 77 deg., and the thermometer ranges between 73 deg. and 82 deg. In the dry season the heat is greatest from January to March, but in the wet, from July to December, it is frequently accompanied by heavy thunderstorms, partially clearing the air. At this time of the year rains are generally abundant and continual. By an estimate it has been found that, on an average, it rains three hours every day, generally towards evening ; about midsummer it sometimes does not rain for a whole month. This season is called the Little Summer of St. John. In the extensive forests of the southern district the annual amount of rain is between 90 and 100

inches. The rain which descends in this tract in one day frequently exceeds what falls in a whole week in the southern countries of Europe during the most rainy period of the year. On the lower grassy plains the annual rainfall varies between 70 and 80 inches. On the higher region of the Andes it rains all the year round, especially after sunrise. On the paramos or higher ground (more than 10,000 ft. above sea-level) it snows and hails continuously, and the air is always charged with a thick fog, which disappears at midnight but returns at sunrise.

Between the Rio Apure and the Rio Meta, both affluents of the Orinoco, are the llanos of Apure, containing the lowest portion of the cattle-plains. The lowest tract is only 224 ft. above the level of the sea, though more than 500 miles distant from that part of the ocean to which the waters descend. This plain is so level that the current of the Apure and Meta is imperceptible, and the least rise in the Orinoco causes their waters to flow back. No rock, no stones, not even a pebble is seen on these plains. The soil consists of a mixture of sand and chalk. It is covered with very nourishing grass, and large numbers of cattle, horses, and mules always find pasture. The only inequalities of the surface are sandhills, which rise a few yards above the common level, and slightly elevated grounds called banks. These banks are hardly perceptible, but are of great value, as they are not subject to inundation, and consequently afford pasturage for the cattle when the lower parts of the plain are covered with water. In the dry season this plain is one immense pasture-ground, until it is again flooded from the Apure and Meta, when the tract on both sides of the lower Apure resembles the Delta of Egypt. The whole plain becomes an immense lake, in which the banks appear like islands. There are tracts then more than 100 miles in length, 20 miles wide, in which the water is from 10 to 12 ft. deep, capable of floating large barges.

The most uneven portion of the cattle-plains lies west of the River Orinoco. This country is covered with low hills, resembling the waves of the ocean when agitated by a gale, being overgrown with coarse grass. The level grassy plains are few, and not of great extent. On the southern edge of this uneven part of the plain are several isolated hills, which are surrounded

by extensive plains covered with fine grass ; these plains may be considered as the commencement of the immense savannahs which extend southward.

The plains of Venezuela extend over about 26,000 leagues, or 312,000 square miles. This tract, though one immense plain, presents a great variety in elevation, climatic, and productive powers. Some tracts are hardly elevated above the sea, whilst others rise to nearly 1300 ft. Some are arid deserts, while the vegetation of others is extremely vigorous nearly all through the year. The trees on these plains stand singly or form groves of small extent.

The Venezuelans are great meat eaters, literally devouring their own flocks of sheep and herds of cattle. The consumption of meat is immense in the country, being almost on a level with Australia. The town of Caracas, with a population of one-tenth that of Paris, consumes more than one-half the quantity of beef annually used in the capital of France. The iguana is eaten and is considered a great dainty. Twenty-five years ago Venezuela had 9,000,000 cattle, 6,000,000 sheep and goats, and nearly 2,000,000 swine. That peculiar animal, the sloth, comes from Venezuela, and so does the ant-eater.

There is at present one refrigerating plant in Venezuela, viz. the Venezuela Meat and Product Syndicate, Ltd., of London. It is situated at Puerto Cabello.

I have not been to Venezuela since 1884, so have had to rely on books of reference for part of the above.

BRITISH GUIANA

British Guiana occupies an area, equal in extent to Great Britain, in the north-east of South America. It is bounded on the north by the Atlantic Ocean, on the south and the south-west by Brazil, on the east by Dutch Guiana, and on the north-west by Venezuela. It has a seaboard of about 270 miles trending in a south-easterly direction, and a maximum depth of about 500 miles. The colony may be divided broadly into three belts. The northern one consists of a low-lying flat and swampy belt of marine alluvium, known as the coastal region. This rises gradually from the seaboard, and extends inland for a distance varying from 10 to 40 miles. It is succeeded by a broader and slightly elevated tract of country composed of sandy and clayey, practically sedentary, soils. This belt is chiefly undulating land, and is traversed in places by tracts of sand-dunes rising from 50 to 180 ft. above sea-level. The more elevated portion lies to the southward of the above-mentioned regions. It rises gradually to the south-west, between the river valleys, which are in many parts swampy, and contains three principal mountain ranges, several irregularly distributed smaller ranges, and in the southern and eastern parts many isolated hills and mountains. The eastern portion is almost entirely forest clad, but on the central south and south-western side there is an extensive area of flat grass-clad savannah land elevated from 300 ft. upwards above sea-level.

The Parliament of British Guiana recently passed a vote of about £12,000 to be used in making a cattle track from the savannahs, in the hinterland, or interior of the colony, to the coast line. The distance is something like 120 miles, and much of it is through dense bush.

A Mr. Ogilvie, who is a rancher in the hinterland, is enthusiastic as to the possibilities of cattle-raising on the savannahs

there, and reckons that, given facilities for transporting cattle to the coast, the colony, ere long, could rely on shipping very many head. He states that the savannahs are capable of supporting large herds of cattle. There are other warm supporters of the opening up of the hinterland, prominent stock-owners who have strong views as to the great possibilities in this direction. At present the only way of disposing of stock is by driving the cattle down to Manaos on the Amazon, and taking what one can get in the market there.

Georgetown, the capital, when I last visited it, was an ideal tropical town. It is situated on the Demerara River, a stream with a very rapid current.

ECUADOR

The area of the country is 116,000 square miles. Estimated population, 1½ millions.

Concerted attempts are being made by influential landowners to raise the stock-breeding and cattle-raising industry to a position of importance, and to enter into the meat export trade. To this end Agricultural Expositions are now held annually at Quito under the auspices of a number of large plantation owners, with the object of fostering the agricultural industries generally. Some of the high valleys and tablelands of Ecuador are particularly adapted to the raising of stock, and a good quality of hides and beef is yearly being produced in the Republic in increasing quantities.

COLOMBIA

THE Republic of Colombia, 440,000 square miles in extent and with a population of 5,000,000, occupies an advantageous geographical and commercial position; its coast is divided by the Isthmus of Panama, facing both upon the Atlantic (Caribbean) and Pacific Oceans, with about 1000 miles of coast-line to each ocean. It is generally predicted that, as the Caribbean becomes more of a highway, due to the opening of the Panama Canal, the commercial importance of Colombia will increase.

Two-fifths of the area of the country are taken up by very broken mountainous territory, the Andes and its outliers, where means of transport are difficult.

The pastoral industries are of great importance in Colombia, and might be very much extended.

The cattle industry is probably Colombia's most important agricultural pursuit to-day, and the Republic offers a promising source of supply for the future, as its cheap lands and cheap labour are prominent factors which are bound to stimulate the industry. Until very recently the country exported annually large numbers of cattle to Cuba and Panama, and this foreign trade, together with an increasing local consumption, so reduced the existing stock that all exports of cattle were stopped, and large numbers were imported from Venezuela in order that the country's own needs might be met.

All the northern coastal region is eminently suited for cattle-raising, more so than any other part of the country; the low lands are covered with grass all the year round, and the higher lands are also green for most of the year, with the exception of January, February, and March, which are the driest months of the season. The pastures are of Para or Guinea grasses, and the lands used for grazing are said to last for many years

with an occasional cleaning, and a burning and a rest during the rainy season.

As to the methods practised in the industry at the present time, it may be said that practically no care is given to the animals, one man taking care of a very large herd ; cows drop their calves in the open ; salt is given to the animals infrequently, not more than once a month, and diseases prevail among them to some extent.

The cattle now produced are not large, averaging only 700 or 800 lbs. live weight, but the breed could be much improved by imported blood. It takes five or six years for an animal to reach maturity, the percentage of calves that live is high, and if the dry season is not too long continued there is plenty of water to maintain them properly. Good grazing lands can be obtained from 4/– to £5 per acre, the price depending on the size of the tract bought, and its nearness to the coast and a navigable river.

The Republic is developing its meat export trade. Contracts have been made for the supply of at least 40,000 head from that country during the current year. Agents from the United States are much in evidence at the present time. One packing house at least is said to be considering the feasibility of erecting a canning plant, possibly at Barranquilla, which forms a convenient port for such a purpose, and the Government has offered a subsidy of £10,000 to the first packing house established either on the Pacific or Atlantic side, the packing house to have a capacity of 50,000 head of cattle per year. There are about 2,400,000 cattle in the country. According to the latest estimate, Colombia should be able to export at least 80,000 head of cattle during the year.

The few small consignments of beef that have come to the English market from the South American Republic of Colombia have, of course, been a stray supply attracted by the unfailing magnet of high prices. It would seem, however, that there are other calls on this supply than the distant European market, as for some time the supply department of the Panama Canal has been bringing cattle from Colombia to aid in meeting the demand for fresh beef in the commissary stores in the Canal Zone. More than 1000 cattle a month have been slaughtered

at Cristobal, Canal Zone, and this will extend, as the meat is said to be cheaper than that brought in cold storage from New York, from which port the supply department was receiving about 100,000 lbs. a month. Freight shortage has made this supply difficult. Meanwhile land has been cleared in the Canal Zone for pasturing imported cattle not in fit condition to be slaughtered for beef; it comprises some 10,000 acres near the Atlantic end of the isthmus, 1500 acres at Empire, 3000 acres at Culebra, and 2300 acres at Corozal, where a Government farm is maintained.

LORD ROTHSCHILD'S HAMPSHIRE DOWN SIX MONTHS RAMS, TRING, ENGLAND

HONDURAS

HONDURAS has an average of 46,250 square miles, and is situated north of the Isthmus of Panama. On the north of it is the Caribbean Sea, on the south Nicaragua, and on the west Guatemala and San Salvador. The fifteenth degree of north latitude runs through it. There are about half a million head of cattle in the country.

The Government is endeavouring to encourage stock-raising by disseminating information regarding improved methods. Stockmen from the United States are carefully inquiring about and investigating the cattle resources of the country. Shipments of live cattle are commencing from the port of Ceiba on the North Coast, and a refrigerating plant is about to be installed near Puerto Cortes. Improved stock are being introduced, and an export of 50,000 head annually is looked for in the near future. Most of the cattle at the present time are found in the departments of Choluteca and Olancho, on the southern and south-eastern side of the country. The entire country is comprised of mountains and valleys. Honduras, being within the area of the north-east trade winds, has an equable and agreeable climate, particularly in the higher lands of the interior. The temperature ranges from a minimum of 42 deg. on the highlands to 97 deg. on the coast. Streams of clear pure water abound almost everywhere during the rainy season. During the dry season, the open ranges being much overstocked, the cattle get into a very poor condition, but with good management this can be easily remedied.

In nearly every part of Honduras there is land suited to the raising of live-stock in a limited way. There are two departments, however—Olancho and Choluteca—where three-fourths of the cattle of the country are raised.

Ticks are prevalent, and the introduction of dips and dipping

is badly needed. On the coast lands and in the interior well-watered valleys, or where irrigation is practicable, permanent fenced pastures are the rule. These are planted with Para, and Guinea grass, which make plentiful and succulent forage.

The average rainfall of the whole country annually is about 48 inches.

The cattle of the country are descended from importations

HALF-BLOOD HONDURAS SHORTHORN BULL, SHOWING MARKED IMPROVEMENT OVER NATIVE TYPE

from Spain soon after the conquest. These naturally have much degenerated, the native stock being small; though fleshed and slow to reach maturity, they generally kill at about 400 lbs. weight.

So far little has been done to improve them, but the advent of men from the United States, as I said before, is making itself felt. Cuba, which possesses itself no less than 4,000,000 head of cattle, used to get a lot of cattle from Honduras, but that island is now fully stocked up. The worst disease in Honduras

is the tick; tuberculosis and foot-and-mouth disease are unknown. Honduras has, in addition to an outlet to the Atlantic, an outlet to the Pacific. The best way to improve the stock would be to import good sires, immune from tick fever, from the southern portion of the United States, and to construct dips everywhere. This country as a meat producer should have a future.

LORD ROTHSCHILD'S HAMPSHIRE DOWN EWES, TRING, ENGLAND

BOLIVIA

Bolivia is the third largest Republic in South America ; it has no seaboard, and its goods are shipped to Pacific ports in Chile and Peru. It has an area of 708,295 square miles, and a population of two and a half million. It is bounded on the west by the Andes, and on the east by Brazil. It is mountainous country, but generally becomes flatter towards Brazil. The hills and particularly the valleys grow very rich grasses on the east side, but on the west the soil suffers from low rainfall ; however, wherever irrigation is introduced, it grows excellent feed. In the future Bolivia should be a big cattle-raising country ; diseases are said to be almost extinct, and the climate is good.

The Republics of Guatemala and Nicaragua in Central America have also excellent pastures for cattle-raising.

PERU

THE Republic occupies a long stretch of territory upon the surf-beaten Pacific Coast of South America, extending from near the Equator to latitude nearly 20 deg. south, and thence across the vast mountain range of the Andes to the Amazon Valley. The sea frontage is 1400 miles in length, and the area of the country is variously estimated between 440,000 and 680,000 square miles, portions being in dispute with its neighbours Chile, Ecuador, and Colombia. There have also been boundary questions with Bolivia and Brazil upon its eastern side. It has a population of 4,500,000.

Cattle and sheep are plentiful, but a lot will have to be done in the way of improving their quality before this country can be taken into account. There is not much prospect for cattle-rearing at present, it is more of a mining country, but there are vast areas of rich grazing lands upon which the famous Alpaca flocks are run, and the land is easily irrigated.

Apart from the more spectacular mining industry, it is interesting to note that the plateau and the limestone flanks of the high inland Andes of Peru are grazed by thousands of llamas as well as by scattered flocks of native sheep, for which the short turf that grows from 11,000 ft. up to the snow line is admirably adapted. An interesting and successful experiment has been carried out by Messrs. Duncan, Fox & Co., who ten years ago imported 6000 well-bred sheep from the Straits of Magellan to form the nucleus of an Andean sheep-breeding industry on modern lines. The flocks have now increased to over 40,000 under the care of Scotch shepherds brought from the Orkneys, the whole undertaking reflecting great credit on Anglo-Saxon American pastoral enterprise. We have the analogy of Patagonia to prove that wherever the guanaco runs —to which the llama and vicuna are first cousins—it is a sign of good "sheep country," and the logical inference is that

2000 miles of the Andean Cordillera, in Ecuador, Peru, and Bolivia, offer for sheep-breeding a region greater in area, even if somewhat inferior in grazing qualities, than that of all Patagonia.

Other Latin-American Countries

Other cattle-raising countries of Latin-America are Costa Rica, with 347,485 head of cattle (in 1915); Guatemala, with 655,386 head, equal to 13·57 head per square mile; Nicaragua, with some 500,000 head of cattle (in 1915); Salvador, with 284,000 head (estimated in 1915), and an excellent future were the industry to be well organized and the export trade supported by adequate shipping.

Group of 2-year-old Heifers and Cows at the Royal Farm, Windsor, England

RHODESIA

THIS vast territory, larger than France, Germany and Holland, is 450,000 square miles in extent, mostly at an altitude of from 3000 to 5000 ft. It contains 90,000,000 acres of good cattle land with excellent natural pasturage, and stock thrive to an exceptional degree in almost every part. No country in the world has better grasses for ensilage-making than Rhodesia. Acres and acres of native grasses can be seen in February and March (towards end of the rainy season) 4 or 5 ft. high, which would give four tons of hay per acre if left till April (commencement of dry season), and would make the best of ensilage ere it got too rank ; with no cost nor care of laying the field down in grass nor topdressing and locking same up, no fencing nor re-grassing at any time. Though the general herds of cattle keep up their condition wonderfully through the dry season (the winter months), though they seldom see anything green, just dry grass with plenty of water, yet the aged cows, the cows with young calves, and all weakly stock, would benefit by the ensilage, to say nothing of topping off forward store oxen in the time of year when there is keenest demand. With plenty of ensilage on hand, the trek oxen could be worked much longer hours. Cattle are largely on the increase, and diseases of all kinds, which are naturally prevalent where there are big numbers of wild animals, are getting rapidly under control. A great point in favour of Rhodesia is that at present it is not cursed with that bane of many countries, the professional politician, and the longer it can be thus free, the more rapid should be its progress.

During the year 1917, 13,221 head of slaughter cattle were sent to the Union of South Africa, and arrangements were made for the extension of this trade to the entire territory in

place of a portion of Matabeleland only. Progress has also been made in the preliminaries for the proposed canning factory, which it is hoped will afford a market for a class of stock not suitable for the fresh meat trade. Consignments of frozen beef from Rhodesia have been sent to England, and have elicited most encouraging reports from Smithfield.

The need of purebred stock to improve the native and grade cattle continues to be one of the most pressing wants, and requirements are still very far from being met in this direction.

The number of dipping tanks is now close upon 1000, and there is every probability of many more being erected in the immediate future. The Compulsory Dipping Ordinance, although its amendment has been freely discussed and is projected, has been widely adopted, till at the close of 1917 it was actually applied to 78 per cent of the farms in the country, and was in course of adoption over a further 20 per cent.

As an instance of how the introduction of good sires to the native herds of a country improves their condition, a few years ago in Southern Rhodesia it was almost impossible to find a native bullock weighing over 550 lbs. dressed weight, at five or six years old. Now, however, it is quite common to find three-year-old steers by a good bull, out of native cows, killing at 700 lbs. Halfbreds have enormously increased in number and bulls continue to arrive by every steamer from the home land. Probably there is no country in the world which at present presents such a good field for the increase and improvement of cattle. It would be a good plan at once to cross the native stock with carefully selected Africander bulls, and get size and hardness into the herds, then cross the improved stock with the progeny of imported purebred stock, and be careful in choosing these sires. A friend who is ranching there now says : " I consider there is no country in the world to-day that offers such good prospects for the ranching companies who are prepared to develop the land as Rhodesia. For the small man who can take up 3000 to 10,000 acres, his capital should be invested in stock and windmills. Fencing can always be erected later. . . . Do not put useless native boys on herding stock ; employ the best boy you have on the farm. Teach him his duties, and do not let him keep the cattle in a bunch, as

one so often sees. Do not kraal at night if you can possibly help it. I am afraid that on a great many farms cattle are driven miles to water and good grazing, only to be brought back over the same long tramp at night to be shut up until the following morning. Remember, cattle do not stray naturally, but only in search of food. Let your calves run with their mothers. Take care that your stock are not roughly handled ; remember that beef cattle never want to lose an ounce of flesh from the day they are born.

" Water is a very important question all over Africa, where stock suffer a great deal through want of it. If you have not a running stream all the year round on your farm, erect windmills wherever possible. They will soon repay the outlay.

" If you water your stock from dams or pools, fence them off, and erect a pump and troughs, so that your stock always have clean water to drink. Remember that stock should never have far to go for water ; it is wonderful how stock will pull through a bad winter if they have a plentiful supply of water.

" In a country like Rhodesia, subject to a long, dry winter, the use of succulent winter feed for stock is very necessary to keep the animals in condition and maintain growth, especially so in the case of beef steers. Maize silage is one of the cheapest and most valuable forms of stock food. Every farmer and rancher should always have a good supply in hand in case of a drought or a bad season. Also remember that once the beef trade is established, the most profitable method of disposing of your grain will be to send it to the market on four legs."

Before rinderpest decimated the cattle in 1896 and 1897 innumerable herds browsed on the well-grassed lands of Rhodesia, which also swarmed with game. These cattle were chiefly owned by the natives, who largely estimated their wealth and social status by the head of stock they possessed. Then came the appalling catastrophe of the rinderpest invasion, followed by East Coast fever, and the land was left desolate. The restocking of the country was largely from the north, and cattle were brought from as far as German East Africa. Angoni cattle, which are a humped breed, were largely introduced. Common native bulls were, of course, used at first ; but as the white man began to pay some attention to

cattle breeding, Africander, Polled Angus, Shorthorn, Friesland, Devon, Sussex, and Hereford bulls were brought in with more or less success.

Encouraging results have attended the efforts of those interested in sheep-raising in Rhodesia. Where the soil and pasture is suitable, the Merino breed is being bred and reared most successfully. Exhaustive trials have been conducted, and it may now be confidently asserted that so long as high-class sheep are used, the future of the sheep-raising industry is safe. Sheep are proving more profitable than other classes of stock, on account of the excellent prices which can be made for the wool.

The Liebig ranch is on the Mazunga, the home station being between thirty and forty miles from Messina drift on the Limpopo, and some 180 miles from Buluwayo.

There are 28,000 head on the Liebig ranch, and the selected mobs of cows have the service of a fine number of pure-bred bulls, Polled Angus and Sussex, these bulls being kept at their home stations to save them from walking the veld with the herds. The increase is given at 70 per cent, which is regarded as most satisfactory; and as the grazing capacity is placed at twenty acres per beast, the carrying capacity of the ranch is 50,000. As this number would soon be reached, it is obvious that a large percentage must move off each year.

The Mazunga Ranch pins its faith to Polled Angus and Sussex, and makes quicker use of the pure breeds, and more use of Colonial cows to speed up the grade. The custom is to put an imported bull, when acclimatised, to sixty cows, while an Afrikander will serve thirty; but the imported bull will be fed at the stables, and the food will consist of greenstuff, bran and oil-cake from the Salisbury monkey-nut oil factory, together with one of the "Oxo" by-products.

A system of paddocking is in vogue at Mazunga, which fences off paddocks of 4000 acres to accommodate 600 head; but the cost of wire has arrested the construction. As one fenced-in paddock is eaten down, the cattle would be moved on to the next, giving the first time to recover.

The purebred stock are sprayed and not dipped, and every evening are examined for tick and rubbed with tick grease if there are signs of the pest.

Nearly all, if not all, disease is insect borne, and it is now realised that to preserve the cattle from inroads of disease, dips must be constructed and used frequently. Undoubtedly, the crossbred, or pure, cattle will be more subject to local maladies than are the native female parent stock. But in Argentina, Queensland, and the Southern States of the Union this difficulty has been largely overcome by careful dipping. Most of the cattle-breeding districts of Southern Rhodesia are at an elevation of from 3000 ft. to 4000 ft., which gives them an advantage over similar lands in other countries situated in the same latitude.

Cattle cannot yet be run in large mobs. Usually, mobs of 200 to 300 are found to be as large as the herdsman can manage, especially as the herding is done on foot. Horse sickness is very prevalent in Rhodesia, and although a prophylactic serum has been discovered for the inoculation of mules, and is successful, the perfected serum for horses has yet to be produced.

The experienced cattle breeder from Argentina, Australia, or the United States must preserve a very open mind if he is to be successful in Rhodesia. All local methods of cattle breeding are not necessarily wrong in principle, because they appear patriarchal and antique, according to our notions, and the new environment will modify many preconceived ideas. The experience of other lands and ways of working is of inestimable value, and slowly many modifications and changes of present methods can be introduced. Any too abrupt change is not likely to work for good. The Kaffirs, who have to be employed as cattle men, understand their own ways of working, and their habits do not lend themselves to sudden changes. The pioneer breeder of improved stock will probably confine himself at first to such elementary changes in native methods as the separation of heifers and young steers from the parent stock, weaning them as late as possible ; the age marking of each crop of calves by ear mark, and changing this annually ; separation and final culling and fattening for sale of the aborting cow or heifer ; the early castration of male calves ; dipping for the destruction of parasites ; letting the cattle run at night where possible, or in the event of this being impossible owing to the shortage of cattle herds, or owing to the presence of too

numerous predatory animals, making the night corrals large, and changing them frequently. The conservation of fodder in hay or ensilage must be taken in hand. The curtailing of the periods of bull service must be done with very great judgment, as these native cows are accustomed to run with the bull, and are not accustomed to taking service at prearranged restricted periods. Any abrupt retiring of the bulls for more than a month would, for many years, result in a much diminished crop of calves at branding time. At first breeders must be content to avoid only the dropping of calves at the commencement of the rainy season. For many years any cow, no matter what her class, which breeds a calf will be retained in the herd until the country be stocked up.

Probably the most interesting and most important development of cattle breeding in Southern Rhodesia has been the acquisition of large tracts of land there by the Lemco and Oxo Company, commonly known as the Liebig's Extract of Meat Company. As a firm of scientific cattle breeders, owning enormous tracts of landed property in Argentina, Uruguay, Paraguay, and South-West Africa, with countless herds of cattle the company has vast stores of successful experience to draw upon, and its presence in Rhodesia is a valuable asset to the country.

"The question is frequently asked," says a recent writer, "'Which is the best country in which a young man with a small capital can make a start at cattle breeding?' With some experience of other lands, I think I can safely give a verdict in favour of Southern Rhodesia. Cheap land can still be obtained to the south of the Zambezi, and if young men will only keep clear of the towns, where the cost of living is ruinously expensive, good use can be made of a small capital. Previous experience in other countries is desirable, but not essential. No man, however, should invest his capital in land or stock without at least two years' experience in the country. The native languages—Matabele and Mashona—should be learned. Under the intelligent direction of the Director of Land Settlement, Government farms have been established to which the aspiring 'Estanciero' can go to learn his work. I met some young men who had enlisted in the Rhodesian Police, and there

gained much knowledge of the country. Particulars of these appointments and of the farms can be obtained from the British South Africa Company in London. In my judgment, the smallest amount of capital with which a successful start can be made is £1500, and the expenditure of this should be spread over several years. Very good judgment will have to be exercised if only this small amount of capital is available. In Rhodesia, as elsewhere, success depends much more on the man himself than on any cash disbursement."

An "old North Queenslander" writes me: "It may interest you to hear of Rhodesia from the pastoral point of view. Cattle raising is quite in its infancy here yet. The possibilities are undoubtedly great; so possibly, in the near future, Australians will be attracted to Rhodesia if they wish to extend their operations to other countries. The company I represent is the Rhodesian Cattle and Land Company Limited (registered in England). We have acquired in Northern Rhodesia 100,000 acres of freehold land in one block on the south bank of the Kafue River, about 100 miles up from the railway bridge. This railway is the main line from Cape to Cairo. This Northern Rhodesia ranch (Lochinvar) is only lightly stocked yet, the first mob arriving here in April, 1911. We have 4000 head now, but the ranch is capable of carrying 20,000 head. This year's calves number 400, and we expect to brand well over 1000 next year. We are breeding from Hereford bulls imported from England and native cows, mostly Barotse.

"The first grade is a better result than I expected, and I hope that in a very few years the herd will be one to be proud of. The country is particularly good. This you may judge from my estimate of the carrying capacity of the ranch, 20,000 head of cattle on 100,000 acres. There is a large area of this ranch which is inundated each year by the overflow from the Kafue River, and it remains flooded for two or three months. After the flood waters have gone, the grazing on this area is wonderfully good, the grass remaining very green until the following rainy season. The grass that grows on these flats is particularly sweet, almost as sweet as sugar-cane, and cattle, pigs, horses and mules all relish it thoroughly and keep fat all the time they are grazing on it. During the wet season, when this

part is unavailable, we have all the stock on the high sand ridges, where Guinea grass grows luxuriantly and the stock do splendidly. We have a fair amount of both classes of country about equally divided in this one block of land.

"Owing to the presence of large herds of game it is impossible to fence in large areas, the game being so destructive. Lions chase the game about at night, and a herd of several hundreds of zebra or large buck will charge into the fences. No fence can stop them. Under the circumstances we are compelled to herd the cattle by day; at night they are yarded into barbed-wire yards. This necessitates a rather bigger staff than that on an Australian station. The herdsmen are natives, three or four to each mob of 500 or 600 head of cattle. It would amuse an Australian pastoralist to see a mob of 600 cattle handled by three men on foot. From this you will see that the cattle are particularly quiet.

"The market for Northern Rhodesia is the Congo, where it is fully expected very big developments will take place in the near future. There are enormous copper deposits in that territory. At present, Congo buyers pay 35/- to 40/- per 100 lbs. dead weight for slaughter stock, the buyer paying railage. The cattle are taken away by rail alive, and the dead weight is estimated before they leave Rhodesia. This price is likely to be maintained (if not improved upon) for some years to come. The presence of tsetse fly in the Congo prevents stock from being bred there in a big way.

"Liebig's Company has lately secured a large area of land in South Rhodesia, and I hear on very good authority that that company purpose erecting a big factory there within two or three years. I understand that this company is particularly pleased with the land it has secured and with the appearance of the stock.

"My company has also a ranch of 150,000 acres of freehold land in South Rhodesia. This has only lately been purchased, and not much has yet been done there in the way of stocking it.

"I am very disappointed that up to the present I have not been permitted to import Hereford bulls from Australia. The Rhodesian Government have not yet decided to permit this, the matter being still under consideration. My contention is

that, as the climate of Rhodesia is almost identically the same as Queensland, stock from Queensland (or any part of Australia) would require less acclimatising than stock from England. I also contend that equally as good blood could be introduced from Australia, and at a lesser cost. Stock in Australia are not so 'forced,' and are, therefore, more hardy and more suitable for the veldt in this country.

"From an agricultural point of view, the possibilities here are also good. I have known from fifteen to twenty bags of mealies to be the return per acre from various farms on the Kafue; ten bags, however, is more general—200 lbs. to the bag. Many parts of the Kafue should grow excellent sugar-cane, the soil being particularly rich. Thousands of acres could be irrigated by lifting water from Kafue River 15 ft., and fed from one main furrow. Thousands of acres could be ploughed without any expense in the way of clearing. Not a stump, or a tree, or a stone to be moved. Many parts closely resemble the best lands on the lower Burdekin country in North Queensland, where sugar-cane grows so wonderfully well."

Mr. Richard Walsh, the British South Africa Company's expert in ranching, gave some interesting information when interviewed in London recently. Mr. Walsh selected the big areas, between 3 and 4 million acres, in Rhodesia, which the company is now devoting to cattle ranching. The million-acre ranch known as Rhodesdale, now in a fairly advanced condition, is partly in Mashonaland and partly in Matabeleland, and the railway runs through it. A bigger scheme, but one much less advanced, is represented in the Nuenetsi territory of three million acres, lying to the south of Victoria. There is also a ranch of 100,000 acres about 60 miles south of Victoria.

Mr. Walsh said:—

"During the past two years we have got together 35,000 cattle, of which 22,000 are on the Rhodesdale ranch, and the balance on the other two. So far, we are simply building up the herds, and we are only disposing of the old cattle. Beyond that, we expect to put practically nothing on the market for three years. At present, we are going on the theory of twenty acres per animal. That is the proportion we are thinking of before starting to export.

Building up the Herds

"The foundation of the herds is native cattle, with the exception of 2500 better bred colonial cows from the Cape. At present we are using a number of Afrikander bulls, in addition to some Shorthorns, Herefords, Polled Angus, and North Devons. These I consider as the breeds that will probably do best in Rhodesia. I have every confidence in the country as a great cattle country. It is notorious that the herds of Lobengula's days were a good deal better than the present-day cattle in Rhodesia, more particularly in size. They had been bred with some care, and it is evident that Lobengula and his headmen had the instinct of stock breeders. They also had, from long experience, an expert knowledge of the best grazing localities.

"Mainly the rinderpest and other diseases threw the cattle back; but we need not fear that sort of thing now, as we have a very efficient veterinary department, and cattle are rendered immune by inoculation. From my experience in other countries, I consider Rhodesia a very healthy cattle country. It certainly has no more disease than any other country, and with our veterinary department and the practice of general dipping, all these will be eradicated.

"The grasses in Rhodesia have better fattening properties than in any other ranching country I know. Very little extra feeding is necessary in the dry months—just enough to help one to take care of the weak cattle. I know of no other country in which cattle carry their condition as they do in Rhodesia through what may be regarded as the 'bad months' from the stock-farmers' standpoint.

Coming Beef Exports

"Our aim for the next few years is to produce a better type of beef animal in much larger numbers before establishing our export trade. While we are building up our herds in this way, there will be a growing surplus of cattle not required for the purpose. The great present want of Rhodesia is a canning factory, and I am glad to say there is every prospect of one

being established at once. That will enable us to deal with meat other than the big export which we are arranging for later—when the meat will be sent to Europe either chilled or frozen. Apart from what the chartered company is doing, several big ranching companies have been started, or are being started, in Rhodesia. As their aim also is the exportation of meat, the country should take a big place in the meat market at an opportune time."

There are 3,961,600 acres of valuable grazing land in the Hartley district. In that 6000 odd square miles, the variety of soils is such as to ensure every possible requirement for cattle-raising or for ranching. Heavy black humus-filled land or rich red loams alternate frequently with stretches of sand veld. If there be those disposed to despise the granite soil, let it be known that among the biggest ranchers there are men who will have no sort of a farm that does not include a proportion of this sand veld in its grazing.

There are eight large rivers and their tributaries meandering through this territory, and when it is mentioned that lime is prevalent along these streams, it can be well understood that Hartley cattle have most of the conditions favourable for heavy frame forming.

Before the rinderpest swept across Africa and well-nigh exterminated the game, Hartley was one of the most heavily stocked grazing grounds of the country. Rhodesia then was like a game reserve in the extent of the herds of bovines it fostered. The remnants of the big buck of these herds had begun to re-establish their depleted numbers at the time the suspicion began to fall upon the larger game as carriers of the tsetse fly. Consequently, since a known "fly" area came to be defined, and was thrown open for promiscuous shooting of even Royal game, the kudu, sable, eland, waterbuck and others of the antelopes, with the elephant, rhino and hippopotamus, have been harried almost to extinction once more, and the parallel shrinking of that tsetse belt is well recognised. It is probable that that area is responsible—though it is a fraction of the total extent of the district—for a widespread belief that Hartley is unhealthy for stock. There is one large ranch in the midst of the "fly" belt; and one farmer, at least, who

claimed an abatement of the purchase price of his farm because he learned that his land was within the confines of the suspicious ground, has now discarded his donkeys and has taken pretty extensively to cattle. The B.S.A. Co. have selected a ranch of approximately a million acres which lies largely in Hartley, and it is being rapidly stocked with valuable cattle; and, furthermore, Hartley's live-stock figures stand first for Mashonaland in numbers, and only Gwelo in Matabeleland surpasses it for the whole of the Rhodesia districts.

The last stock census showed 33,002 cattle in the district. This is at the rate of 120 acres per head, so it will be seen that there is vast room for extension. Though at present there are more farms returning statistics than in any other district, there is much land still for sale. Though some of the best of the pedigree bulls have been imported that have come from Hartley farms, the great bulk of herds, so far, like those of all Rhodesia, are not far removed from the native stock, having very largely, originally, been purchased or traded from the kaffir reserves around. That source of origin accounts for the hardiness in herds that earned the district its true reputation for cattle health.

Hartley, with much of South Africa, has been suffering keenly during the past few years from uncertain rainfall, and a depression of a like period in cattle prices has struck it hard as well.

During these lean years the stock has been multiplying in a steady increase, though their cash value as individuals sank at times far below their purchase price. Under that steady fall there has been little inducement even to disperse a herd that gave little promise of interest on its capital value, for "a pound a leg" has been a very common bid at auctions. A holding-on policy has, therefore, been the rule, and now the reward seems in sight, and the larger profits will now be the more easily secured because of the hard experience gained in carrying on through the seasons of narrow margins. The almost vanishing prices being paid for grain, as against the steadfast price of butcher-meat has done much to press home the desirability of selling crops on the hoof. Outbreaks of East Coast fever occurring urged the compulsory dipping that

is now in vogue, and that compulsory clause enforced the building of the requisite tanks. Seeing the night herding, especially of working oxen, that other districts have to resort to, impressed the excellence of the Hartley pasturing, that renders that expedient unnecessary, but the benefits of the free night grazing are so well recognised that wherever possible fenced paddocks have ousted the primitive kraaling methods. The number of miles of fencing will immediately be extended so soon as wire is again reasonably procurable.

Southern Rhodesia offers the farmer three varieties of climate and country, says a recent writer :—

" (*a*) The high grazing veld of Matabeleland, with an altitude of 4000 feet ; (*b*) the higher altitude of northern and middle Mashonaland, with a greater rainfall and favoured conditions for the culture of mealies, tobacco and oranges ; and (*c*) the low-lying country skirting the Limpopo, which is also suited to cattle. There are ranches in Mashonaland on the granite lands which are too poor for mealies, but the cattle are found chiefly on the Matabele side where the grass is shorter, and, it is said, sweeter. The Zulus, like most natives, were good judges of cattle country, and when Moselikatze went north, he picked his site on land where now are most of the white cattlemen, and his herds grazed west to where the big Rhodesdale ranch is situated, and south to where the other big ranch, owned by Liebig's, is located between the Limpopo and the Matoppos.

" Formerly, business men in Bulawayo talked ' gold ' ; now they talk ' beef ' ; and in the clubs most heated arguments rage between the Hereford men and the Polled Angus followers, while Shorthorn, North Devon, and Sussex admirers have a say. As a matter of fact, no breed has yet been proved, and the ranchmen are at present finding out not what breed is best for the whole country, but what breed or breeds do best under the varying conditions in various districts. The B.S.A. ranchmen have, for example, satisfied themselves that Shorthorns do better on the southern ranch below Victoria than they do at Rhodesdale, while Liebig's are inclined to think that the Polled Angus and Sussex are the best choice. They are trying out the breeds, and as they swap experiences, they will in time

select their fancies and stick to them ; but it seems clear that the recognised beef strain will differ in one district from the other, which means that most breeders of pure-bred bulls may expect a market in Rhodesia. Last year over a thousand head of heifers and bulls were imported, chiefly from the Union, and each year the big ranches are on the lookout for bulls. In September last Mr. Fleming (manager of the Rhodesdale ranch) was in Bulawayo district looking for 150 young bulls, and he purchased fifty from one breeder. As he told me, he was pleased to find that the small breeder had become alive to the necessities of the big ranches, and had been concentrating on the breeding of pure-bred beef strain with excellent results.

"In time the big ranches will create their own bull-breeding herds, but this will not be for another five years or so, and even then the smaller ranchmen will be in the market for sires. They run, on the average, one bull to thirty cows, and as a small ranch would carry 7000 cows, each such ranch would require 230 bulls.

"The Chartered Company's two ranches at Rhodesdale and Victoria cover together about 70,000 head ; Liebig's carries 28,000 head ; and the ranches run by De Beers, the Anglo-French, and the Central Estates are coming on. In addition to these there are numerous small ranches which carry from 300 head up to 7000 and are rapidly growing. All these ranches are breeding beef, and to breed beef they must have pure-bred bulls of the beef strain, together with heifers, and this demand creates, as I have said, a market worth studying. It may be noted that they have nothing to do with Friesland, Jersey, Ayrshire, and other dairy breeds ; and it may also be mentioned, to avoid trouble, that many of the cattlemen in Rhodesia know more about the beef breeds than most breeders in South Africa, and that they will not take inferior animals."

Naturally a big ranch costs money in the creation. The Chartered Company recently spent some £20,000 on native cattle, representing a fraction of the outlay, and Liebig's have probably spent well over £100,000 in live-stock. Expert knowledge is required to protect such large interests, and the B.S.A. Company secured the services of two experienced cattlemen

from the United States, in the persons of Mr. R. Walsh and Mr. H. Fleming. Be it understood these are not cowboys, but gentlemen of education, who have made it their business in life to study cattle and their management, beef production, and the marketing thereof. Mr. Walsh directed a big ranch in America, and Mr. Fleming had twenty-one years' experience learning the business, as he puts it, "all sides up." It has been asked in Rhodesia why South Africans were not engaged, and the answer is that ranching was not known in that country, and that the huge undertaking necessary would have seemed beyond the range of men accustomed to handle cattle in small numbers. The United States is the biggest cattle country in the world, and its ranchmen have "thought in thousands," and handled the conditions which threaten to overwhelm the manager who is not used to cattle by tens of thousands. There is a boldness in the design of a large ranch that must rather dismay the cautious man, and Mr. Fleming relates that when he went on the market once to buy 150 bulls at one swoop the eyes of an old-timer nearly popped out as he cried: "One hundred and fifty! My word, I thought I was going strong when I bought three at a go!" South African breeders know cattle fore and aft, top and bottom, but they did not have the experience of ranchmen, and accordingly the Chartered Company sent to the United States for two cattlemen of proved knowledge, capacity and tact. The two stepped into their places quietly, carved out one million acres from the unoccupied land, divided this enormous area into seven blocks, and set about building up a beef strain, on the bedrock of the small but hardy native stock; and they have gone their way unobtrusively, working out their ideas without forcing their opinions on others. Liebig's Ranch followed the same large lines of development, but not the same policy of breeding.

It will be seen by the foregoing that the possibilities of Rhodesia as a beef-producing country are enormous, and fair supplies of excellent beef can be looked for in the immediate future. To the west there is another very excellent fertile country in Bechuanaland, containing 225,000 square miles of ideal cattle country. However, the cattle at present are of the native type, and very little has been done in improvements so

far ; but once the war is over there is little doubt that in time that country will be exploited and its herds improved.

The Rhodesia Meat Packing Company, Limited, has been formed, with a capital of £100,000, to acquire a piece of land situated at Odzi Station, Mashonaland, with water rights on the Odzi River, for the purpose of erecting meat-canning and freezing works. The capacity of the factory is to be approximately 75 beasts per day. It is the intention of the company, as soon as the canning works are in operation, to proceed with arrangements with a view to the freezing and export of meat for shipment overseas.

Essentially, Rhodesia is a stock country. The conditions point strongly to meat as the principal ultimate product to be elaborated off the veld. Dairying, too, undoubtedly has a bright future, yet primarily beef is to be looked to as Rhodesia's staple export to the world's markets ; milk, butter and cheese will chiefly meet the local demand.

Cattle-raising requires more capital and a longer time before profits accrue, but ultimately yields a higher return. Crop-growing yields a more regular and an earlier return—a more vital consideration to the newcomer and the man of limited means. Ranching, or at least cattle farming on extensive lines, is a growing feature of the times in Rhodesia, so far with a very promising measure of success, the one general want as yet being numbers. The indigenous native cattle supply the foundation stock, improvement being gradually effected by the introduction of bulls of European breeds. The Government is endeavouring to encourage the systematic improvement of cattle in the country, and steps for the establishment of a stud farm have been taken, whilst no inconsiderable time is devoted to tendering information and advice on the subject.

There is no doubt that Rhodesian methods in cattle farming are advancing, the most noticeable signs being increased attention to such matters as hay-making for winter use, production of forage and of root crops for stall feeding, the construction of dairies and dipping tanks, better housing, more attention to the care of calves, and, perhaps above all, fencing. Changes in the direction indicated are conspicuous on some of the large ranches in Lomagundi and the farming districts of Goromonzi,

Umtali, and elsewhere, where cattle now run day and night in camps, undisturbed and free, with very obvious advantages, as against the primitive custom of herding all day and kraaling at night. The mortality of cattle from casual ailments and accidents is singularly low throughout the country, but particularly so where fencing enables the nightly concentration in kraals to be avoided—an effective protection against the appearance and spread of contagious disease—and where the conditions of life are otherwise rendered wholesome, natural, and easy.

Major R. Gordon writes me from Beira, Portuguese E. Africa, under date 13th October, 1918 :—

"I have been on special duty since February this year, buying cattle for the Imperial Government in Southern Rhodesia, for export through Beira to German East Africa and Portuguese E. Africa for the troops in those territories. We send them away alive, not frozen. The cattle have some hundreds of miles to march after disembarking at the coast. Cattle in Rhodesia are worth 40/– to 45/– per 100 lbs. dead weight, and have greatly improved here the last few years. Many breeders are progressing rapidly on sound lines.

"Liebig's Company has a ranch in Southern Rhodesia of about $1\frac{1}{4}$ million acres (freehold), and they have now about 32,500 head of cattle on this ranch. They go in for Sussex and Polled Angus breeds.

"The B.S.A. Company have a ranch, too, in Southern Rhodesia, and their herd is about 70,000 now. That company go in more for Herefords, but they have some Polled Angus cattle as well as Shorthorns and N. Devons. Most of the famous breeds from home do well in Rhodesia. There is no doubt that Rhodesia will one day be a recognised big cattle producer."

SOUTH AFRICA

THE Union of South Africa, comprising Natal, Transvaal, Orange State, and Cape Colony, continues rapidly to grow in importance as a source of Empire meat supply. The pastoral condition of the country is eminently suitable for beef production on a large scale, and the existing herds of cattle, which in many parts are being rapidly improved, already total 8,000,000 head. Everywhere one sees efforts to improve the quality of the beef and to make it suitable for the export trade. Freezing works are being erected and enlarged at the various ports, and railways are being extended. There is an ever-increasing demand for stud cattle of both milk and beef breeds, and African buyers at times almost equal those from the big South American Republic in the prices they offer the British breeders. Even during the war, continual consignments were being received. Under an arrangement entered into some years ago between the Union Government of South Africa and the Union Castle Mail Steamship Company, it is provided that the shipping company shall carry pedigree cattle freight free for a stipulated number of years. No charge is made for freight, but a charge is made for fodder and attendance of £4/15/– per head, and a very active demand, and an increasing one, is being made for all descriptions of high-class animals. Some years ago Mr. Armour, of Chicago, stated that, in his opinion, South Africa was the grandest ranching country in the world ; it only needed brains, industry and enterprise. Cattle since 1904 have increased from 3,500,000 to, in 1917, 8,000,000 head.

The generous policy of Sir Owen Philipps in carrying pedigree stock from Britain to South Africa free of charge since he took over the Union Castle line and obtained the renewal of the South African mail contract is undoubtedly having beneficial effects throughout the Union. Instead of being bred for

" trekking " purposes only, as in the past, bullocks are now bred for meat, and there is great improvement not only in the quality, but in the dressing also, of the frozen article sent to the English markets.

Without doubt, South Africa is destined to be a beef-export-

TYPICAL KARROO SCENE. ANGORA GOATS AND OSTRICHES, GROOTFONTEIN, CAPE COLONY

ing country on a large scale before many years are over. At present the quality all round needs standardising, and the butchering and dressing requires improving ; but this is undoubtedly being seen to by those who wish to see the industry firmly and profitably established ; they are details.

The meat is now a more or less regular feature on Smithfield market, and it is gradually becoming more regular in quality

as the producers become better acquainted with the market needs.

A very fine sample of South African beef was to be seen recently in the Smithfield market. This was a consignment of 16 beasts, averaging 880 lbs. per body. The quarters made a very fine show; they were prize meat from the Johannesburg Fat-Stock Show, having been sent by the South African Meat Export Company after exhibition in Johannesburg. The meat was from Aberdeen-Angus cattle, with a strain of Devon. Its condition was perfect, good butchering being another quality, which it was welcome to see. The meat fetched 8¾d. by the side, and attracted a good number of visitors from outside the market, including Sir Owen Philipps, K.C.M.G., M.P., the well-known Royal Mail Steam Packet chairman, who has done so much to further South African trade.

Farmers in all parts of South Africa are awakening to the potentialities of the meat export industry, and various concerns are being formulated to take up the business. The pioneer concern, known as the Farmers' Co-operative Meat Industries Limited, has increased its capital considerably to enter upon a larger enterprise, and another large company, comprising some of the best-known names in South Africa, has been formed.

Sir Thomas Robinson, the Agent-General for Queensland, has during the war been purchasing on behalf of the British Board of Trade South African meat as well as Australian, New Zealand, Argentine, Brazilian, and Canadian, but the quantities since the beginning of 1917 are not known, neither is the destination of the meat. Over and above the purchases on behalf of the Government for Great Britain and the Allies, there have been some small shipments, sometimes 500 or 600 quarters, direct to London by the Union Castle boats. The meat has fetched an average of 9d. to 11d. per lb. for hindquarters, fores selling in the usual corresponding ratio. In 1916 the export of frozen meat from South Africa amounted to 17,687,121 lbs., valued at £354,341. All this was beef; there is no mutton going forward. Of the above quantity 4,297,313 lbs., valued at £75,399, went to the United Kingdom markets; the remainder was for Government contracts. These figures show a great advance

over those of 1915, when the total export of meat from South Africa amounted to 6,056,435 lbs., valued at £107,362. England took 5,095,000 lbs., of the value of £86,000. Complete figures for 1917 are not available, but the total export of beef up to 30th June amounted to 91,263 quarters, this quantity including the Government contracts. The second half of the year is always the busiest shipping season. The South African farmers are making big strides, and are doing all they possibly can to put the industry on a firm basis. Certainly an industry which is already bringing in over £300,000 a year is one which is bound to receive encouragement. There is so much refrigerated produce now sent away from South Africa that the cold storage facilities at the ports are quite inadequate. The stores are often full up, owing to the shortage of tonnage.

Everything points to the beef export trade of South Africa being a huge thing within a few years. For the past two or three years farmers have been repeatedly urged by the Government experts and other authorities to improve their cattle, and to direct proper attention to the question of feeding. This advice has not fallen on deaf ears, for there is already a very noticeable improvement in both directions. Again, farmers now comprehend the wisdom of the dipping practice, and losses to-day are almost negligible as compared with those of a few years back. The potentialities of the Union in this direction have impressed many, and adequate preparations are being made to deal with the future herds of the farmer. Four huge cold storage works and abattoirs are being erected at Durban, and the Government is extending the Congella wharf by about two miles. Similar works are being erected at Port Elizabeth, and at several inland centres; also at Lorenzo Marques in Portuguese territory. The capacity of the coastal works will be such as will enable the companies to export throughout the year, the idea being to purchase almost entirely during the summer and autumn months.

The following description of a South African cattle property, by the principal of the School of Agriculture, Cedara, Natal, will be of interest :—

"This property, comprising some 100,000 acres of dry sand country, is near Mafeking, and the herd is a monument to the

adaptability of the Shorthorn, and also of his prepotency and impressiveness as a sire. That other of the improved breeds might have done equally well is not denied ; but in this case the Shorthorn was the improved type used. It is proposed to give details in regard to this successful herd, and to show what is so apparent, viz. that the continual use of highly bred bulls of sound constitution and excellent stamp has increased the value per head of the cattle considerably, whilst turning out an annual surplus of animals of the butcher type full grown and fat at three to four years old, which, when killed, give meaty carcases fully calculated to meet the demands of the European market.

" Eleven years ago a commencement was made by Mr. L. S. Meintjes with a small Shorthorn herd. Three years afterwards, in conjunction with the African Farms Ltd., 500 breeding heifers and cows were obtained, chiefly in the Cape Province, and with the exception of some Friesland-Jersey crosses, a few North Devons, and some nondescript animals from South-West Africa, all the original cattle showed Shorthorn blood.

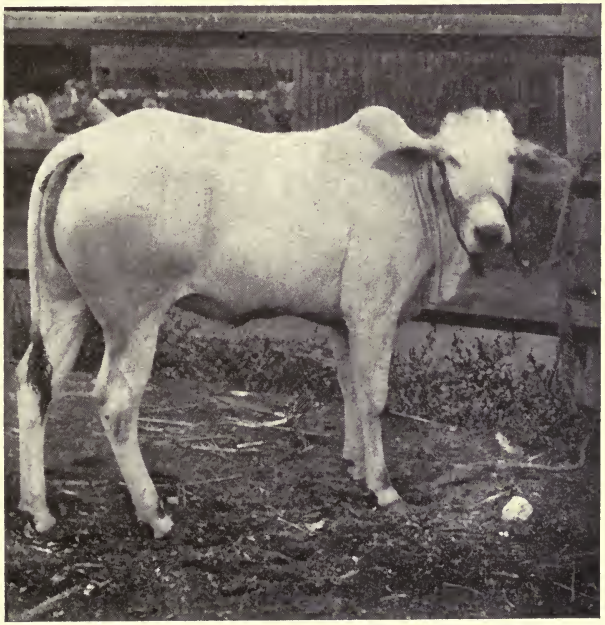
" In 1907 the company started importing bulls, when two Lincoln Reds were obtained, their breeding showing some Coates Shorthorn blood. Since then only good, well-bred Coates Shorthorns of the " Scotch " beef type have been used, and all these bulls trace back directly or indirectly to the herd of Mr. W. Duthie, of Collynie, and thence to the Cruickshank herd.

" Females have from time to time been imported. The first batch of Lincoln Red females do not appear to have done well. They did not maintain themselves in good condition. Nineteen purebred Coates Shorthorn cows have also been imported for the purpose of breeding bulls for use on the ranch, and for sale. Such home-bred purebred bulls find a ready market. The imported cattle, after becoming acclimatised, do just as well on the veld as the grade cattle reared on the estate. Age for age, the females bred on the ranch are equal in size to the imported animals. The bulls are smaller, however, as no attempt is made to force their maturity.

" Taking the original mixed herd, each generation shows some improvement over the original, but now and then a

A Drift on a Natal River, the Umsindusi, near Maritzburg, Natal

throw-back appears, and they will appear for a number of years. Contrary to expectation, the higher graded animals from the original cows, with strong Shorthorn foundation, of which there are now four generations represented on the ranch, do not show any tendency to lack of vigour and hardiness, being quite as robust, if not more so, than the original cattle. This robustness of constitution, with the consequent ability to



Zebu Heifer from Southern India. Nellore Variety

make the utmost use of the veld, has been secured by a fairly strict selection of breeding females and a very strict adherence to substance, strength, and vigour of constitution in the sires used.

"In addition, taking seasons into consideration, the succeeding generations show progressively greater tendency to early maturity, thus demonstrating that the finer bred cattle can make as good or better use of the veld than their presumably more hardy forbears. The same also holds for the lower

grades, from the very mixed Jersey-Friesland and Africander foundations. This finding encourages the owner of the ranch in his idea of persisting with Coates Shorthorn bulls of the right stamp. The paramount idea has been to produce an ox matured at three to four years, and dressing up to 800 lbs., from the veld alone.

"At present on the ranch there are some 2500 head of cattle, which numbers are being gradually augmented. Of this number, 1000 head are breeding cows and heifers. For this number of females there are kept eighteen bulls.

"The cows are offered service at any time during the year,

Merino Prizewinners at Witwatersrand Agricultural Show, South Africa

there being no fixed service period. Thus, calves are dropped every month. The method of service is to take the stabled bulls down to the various watering places and to await the arrival of the cows from the veld. In this way there may be served, say, four or more cows in a morning, and in the afternoon different bulls are taken down. It has been found inadvisable to allow a bull more than three cows in any one day. Thus, the dry herd, at the height of the season, will require the services of as many as six different bulls in the one day. In the far distant camps there are erected bull sub-stations, so that the bulls may be kept at their stations without the long trek back to headquarters, being fed and cared for near one of the watering installations.

"Heifers are mated usually about twenty months to two years old, according to size, it having been found that to allow them to go any longer engenders barrenness, owing to their being too fat to settle to the bull. Taking the average, the percentage of calves per annum, or the breeding efficiency of the herd, is in the neighbourhood of 60 to 65 per centum. As stated above, calves are dropped every month. It has been observed that those calves born in the dry winter months are slower in maturing. It is a matter for consideration whether the additional expense for bulls and the risk incurred in having a definite breeding season would be entirely counterbalanced by the admittedly greater uniformity of the young stock which would ensue. Calves are weaned usually at ten months, or younger. Bull calves are castrated at from three to ten days old. Weaners are run well towards the outskirts of the ranch, and after a year those heifers of satisfactory size are returned to one of the breeding herds. Oxen are drafted on to good rearing veld at nine months, well away from the centre of the ranch, where they grow out, and, when about three years of age, drafts of oxen are taken on to the best veld and given some months in which to finish.

"The oxen reared on the ranch are large, of a desirable beef type, though somewhat long in the leg, and, perhaps, rather coarse in the front; they are weighty and otherwise of good conformation, and dress out well at slaughter.

"The following particulars of oxen from the ranch at four years, exhibited at the agricultural show at Johannesburg on the 6th to 9th April, 1915, and slaughtered at the municipal abattoirs, may be of interest. It may be mentioned that these oxen were retained at the ranch as not being good enough to go forward with the consignments about four months earlier, and consequently they are a little older than the average :—

Catalogue Number.	Live Weight Shrunk.	Carcase Weight.	Estimated Frozen Weight.	Dressing Untrim'd.
	lbs.	lbs.	lbs.	%
649	1165	695	660	59·0
648	1126	683	649	60·6
656	1208	727	690	60·0
647	1176	694	659	58·0
654	1210	725	688	60·0

"Description of No. 649.—Shorthorn, steer, four years. Condition good to choice, smooth, loin fairly well covered, ribs require to flesh down further.

"Type.—Beef, good width and depth, little paunch, inclined to be leggy, not coarse. Hindquarters excellent. Shape, a little lacking in flesh, quarter good, twist and flank fairly full. Skin handles well.

"Carcase.—Covering smooth, half-inch of fat over loin, slightly hollow in loin, and lacking a little over the shoulder and ribs. Slight marbling, fine quality, lean bright. Fat, light yellow.

"The description of the others would be in many respects similar to the foregoing."

Sheepbreeding in South Africa

Despite droughts and the ravages of diseases the flocks of South Africa (British) increased from 16,000,000 in 1904 to 36,000,000 in 1913. According to a recent issue of the *Farmers' Weekly*, published at Bloemfontein, the estimated clip for the season 1917–18 was 490,000 bales. This estimate is arrived at by taking the average quantity of bales exported from South Africa during the last five years, but owing to the season throughout the Union having been exceptionally good, the clip is likely to exceed 500,000 bales.

The number of bales of last season's wool left in the open market was 478,348.

The quantity of wool sold on open market and shipped during the period 1st August, 1917, to 31st March, 1918, was as follows :—

WOOL IN GREASE

Destination.	Lbs.	Value.
United Kingdom	773,943	£46,343
France	59,800	4,625
Canada	171,672	10,277
United States of America	34,664,093	2,334,872
Japan	30,374,619	2,514,875
Total	66,044,127	£4,910,992

Average price per grease lb., 17·89d.

SCOURED WOOL

Destination.	Lbs.	Value.
United Kingdom	18,017	£2,522
Canada	239,020	28,186
United States of America	7,185,322	1,203,179
Japan	986,735	168,083
Total	8,429,094	£1,401,970

Average price per scoured lb., 39·93d.
Total grease and scoured in bales of grease, 265,080 bales.

In wool production, therefore, South Africa has made great strides, and the limit of expansion has not yet been reached. The writer visited the country about seven years ago, and it was comparatively easy to note the scope for development of the wool industry. There was, at that time, a remarkably keen interest in sheep, especially the Merino, and there were many fine stud flocks, and millions of pure wool-bearing sheep. But at the same time one could not look upon the vast extent of unfenced veld without wondering how much fencing wire and subdivision would add to the carrying capacity.

One could not notice the numerous flocks of goats, Persian sheep, and bastard sheep, without picturing the state of affairs when these nondescript flocks are replaced by pure-woolled sheep.

Then the necessity for draining swamps, and providing pure sources of water supply, planting trees for shelter purposes, and grazing flocks within fenced areas, instead of shepherding them all day and kraaling them at night, were being realised by progressive sheepfarmers. Another factor most noticeable was the splendid efforts on the part of the South African Government to develop the sheep and wool industry. Experimental farms and colleges were established throughout the Union. The services of capable experts were at the disposal of sheep-owners, and behind it all was a magnificent laboratory of research conducted by Sir Arnold Theiler, devoted to assisting stock-owners in combating the numerous and deadly diseases that affect live-stock in South Africa.

All these facts have counted in the development of the sheep and wool industry in South Africa, but another factor might well be mentioned.

After the smoke of the Boer War had cleared away, the

African farmer of Boer extraction saw that he was only eighteen or twenty days from the London market. He appreciated the proximity to such a market, and he set out to develop a connection with it. At the time of the Boer War, South Africa imported large quantities of meat, chiefly from Australia, and for years after the war these importations continued. The imports of beef and mutton in 1903 (excluding the quantities brought into South Africa by Orange Free State) were valued at £2,885,000 ; in 1906, £757,000 ; in 1913, £105,000 ; and in 1915, £593, so that the quantities steadily diminished each year, until in 1915 they almost reached vanishing point. On the other hand, exports show a consistent increase from 1914, when 55 tons, valued at £2,408, were sent overseas ; in 1915, 2274 tons were sent, value £86,000 ; and in 1916, 5520 tons, total value £215,735, 2150 tons being for civilian and 3370 tons for army purposes. The figures of last year are not yet available, but the estimate is 21,000 tons—1000 tons for the United Kingdom and 20,000 tons for the Army, all these quantities being exclusive of supplies for ships' stores.

Australia has a particular interest in the development of the sheep and wool industry of South Africa, because South African sheep-breeders have for many years been extensive purchasers from Australian stud Merino flocks. As a matter of fact, the leading stud flocks of Australia are just as familiar to South African stud-breeders as they are to Australian and the merits of rival Australian flocks are just as hotly discussed in South Africa as they are in their own country, probably more so.

The importations of Australian stud Merinos into South Africa from 1906 until the outbreak of war have been as follows :—

Year.	No. of Sheep.	Value.
1906	10,782	£29,489
1907	5,380	21,495
1908	6,932	15,720
1909	1,421	15,774
1910	2,344	20,197
1911	2,440	20,470
1912	5,234	35,545
1913	5,349	36,165
1914	2,581	18,370

South African stud-breeders have shown great enterprise, and have proved themselves to be equal to their Australian

contemporaries, when it comes to backing their fancies with their cash. Many high-priced rams have gone to South Africa. Even the war and the absolute dislocation of shipping between Australia and South Africa did not daunt the spirit of South Africa to progress, for Mr. J. S. Minnaar, of Cape Colony, purchased a ram from F. S. Falkiner and Sons, Limited, Wanganella Estate, for 2000 guineas during the war. This was a plucky purchase in times like those, when shipping was so disorganised.

Mr. P. Greathead, presiding at the annual meeting of the Transvaal Land-Owners' Association in May, 1919, said :—

"It is only since the war began that we have become a meat exporting country, and until quite recently we had not really recovered from the heavy wastage of stock during the Anglo-Boer War. Indications are very definite in showing that big expansion is in progress. Quite a number of ranching companies have been formed, and individual farmers are paying much attention to their live-stock husbandry, as is shown by the greater appreciation of improving sires. Never before were such prices realised for highly bred beef and dairy stock as during the last year. Reports on consignments of beef to oversea markets have been highly complimentary to the stock of the country and are very encouraging to growers, and I think that many of our members could not do better than establish herds of cattle on some of their bushveld land, which is so highly suitable for the purpose. I think they would find that with careful management—which is necessary in all business—their ranching efforts would be very remunerative. I have recently gone into the question of the cost of production. I find on examining American statistics that it costs these growers to-day thirty dollars—say, £6—to produce a yearling steer, and that it costs them forty-two dollars—say, £8 8s.—to produce a two-year-old marketable steer. Allowing that the American two-year-old steer is equal in weight to our four-year-old, I find that we can produce meat at from one-third to one-half the cost to the American grower. General agricultural statistics in this country are not available, but by examining my own Company's case, and the cases of numbers of other cattle farmers, I find that the cost of raising a four-

year-old steer on bushveld land, at ten shillings an acre, is from £3 to £4. Our four-year-old steer and the American two-year-old would weigh approximately 600 lb. dead weight each. Scrub cattle with improving bulls will yield £2 per head per annum throughout the herd in increased value if economically managed, or, say, 20 per cent per annum on outlay. There are, however, varying factors, namely, seasonal management, scale of operations, etc. The larger the scale, within limits, the greater the net profit. A 600-lb. steer would cost approximately £4 to raise, say, 13s. 4d. per 100 lb. The present world's market value at any of the South African abattoir or chilling centres is 48s. per 100 lb. for prime beef, 40s. for medium, and 35s. for so-called compounds. Each four to five-year-old steer will bring £12 to £15 and upwards on the market. The cost of marketing, transportation, etc., would vary with circumstances from 10s. to 20s. per beast in the round. There would therefore be from £7 to £10 profit on each steer sold. I think the inference is obvious.'

MADAGASCAR

THE French Island of Madagascar lies off the coast of East Africa, and runs 1000 miles north and south, with a breadth up to 360 miles. It is 226,000 square miles in extent, and is mostly mountainous country, from 3000 to 5000 feet high, with healthy, well-grassed undulating valleys and low hills. Madagascar has large herds of cattle (the tax paid by the

SOISSONNAIS AND RAMBOUILLET RAMS
Held together by "Tanosy" shepherd.

natives some years back was on 5,000,000 head) and it is an ideal country for cattle-raising. The herds number fully seven millions at present, and beef is already being exported. In a few years France could, by the importation of stud bulls, enormously increase not only the numbers, but the weight of the present stock, and, without trouble, fill the gaps in their own meat supply by beef from this beautiful island of theirs. Any visitors to Madagascar must be impressed with the richness of the grasses, not only in the numerous valleys, but on the hills. Burnt year after year by big fires, it

springs up again with a profusion much more than sufficient for the present stock running on it.

In fact, the pasture land of Madagascar is almost unrivalled in any part of the world. A committee which was appointed recently by the French Government to investigate in what manner the native cattle would be able to contribute towards the meat supplies of France, has sent in its report. The following conclusions were arrived at :—

" (1) The introduction of live-stock from Madagascar into France can be realised very soon, and all that is needed is transportation facilities ; (2) if the cold store works actually existing in Madagascar can increase their capacity, the exportation of live-stock will be followed by that of frozen meat ; (3) owing to the difficulty of obtaining from the shipowners or navigation companies the boats needed for the transportation of live-stock intended for exportation, the committee thinks that as the State is the sole purchaser of this live-stock, it ought to have entire charge of its transportation ; (4) it would be in the Government's interest to employ competent persons in the shipping and landing centres to inspect the shipping operation and purchasing of the cattle ; (5) it would be advisable to leave plenty of room for private enterprise."

The export of canned, frozen, and salted meats is even now an important industry in the island, some thousands of tons being shipped annually.

The large establishments at Majunga (belonging to Messrs. Vestey Bros.), Diego-Suarez, and Tamatave are busy turning out meat for the French Army.

The bulk of the beef exported from Madagascar was put up in tins until recently, when the Societe Rochefortaise, from its Tamatave plant, began shipping frozen beef by the ships of the Compagnie Havraise Peninsulaire de Navigation a Vapeur.

The three ships already fitted out with cold storage chambers for the exclusive use of the products of the Societe Rochefortaise can accommodate 200 tons of frozen meat each, which space corresponds with the present capacity of the local storage plant. But this plant is soon to be enlarged so as to be able to store 500 tons of frozen meat, and at least three additional ships are to be fitted out with cold storage chambers of equal

capacity. The cold storage space in each of the three ships already being used can be increased to 500 tons.

The question of drawing largely on Madagascar and other French colonial possessions for the meat supply of the French Army and civil population has been under consideration for some time in official and commercial circles in France. Several attempts have been made by private concerns to import live beeves from the island into France, but these trials, it seems,

YOUNG MADAGASCAR BULL

Between 3 and 4 years of age, and one of the principal herd boys on Mr. Sutherland's property. The hump is a good one for a three-year-old bull.

were not encouraging because of the long and severe voyage, especially during the passage through the Red Sea.

Large numbers of Zebu cattle, averaging about 800 lbs. live weight, are being shipped to Salonika for the French troops.

Madagascar, as anyone may see by a glance at the map, is situated right on the " wool belt " of the Southern Hemisphere, although rather to the north of the great pastoral lands of Australia, South Africa, and South America.

There is a considerable variety of climates. The east coast has a heavy rainfall, and no really cold season. The extreme south and the western slopes of the main range of mountains are much drier, and in the south they have some very cold

weather in winter. The difference between the eastern and western sides of this range of mountains, which extends right through the island, is very striking when you travel from Fort Dauphin. Up to a small village called Ranopiso, twenty-two miles from Fort Dauphin, vegetation of the ordinary tropical character and rice fields, mango, and banana trees are conspicuous on all sides. Between Ranopiso and Bevilang ("Many Saucepans"), however, a long range of hills is crossed, and the character of vegetation changes completely. At Bevilang, which is only ten miles from Ranopiso, the vegetation is of a unique character, and all the trees are powerfully armed for resisting drought. In many instances leaves have practically disappeared. The stem has swollen, and seems to take the place of leaves. Then these stems and leaves are covered with a thin film of wax, which acts as a further protection against the evaporation of moisture, while the "latex" or milky sap, which flows in the bark of so many trees and vines of the country, and provides some very good rubber, seems to be intended as a further protection against drought.

Another protection is needed, however, to prevent the extermination of plants valuable as forage, and this is a protection against cattle stock itself. This is abundantly provided. There are more thorns to the square yard in the Ondroy bush than there are to the acre of English forest. The fantsi-holicke, a wonderful tree, which has been compared to a forest of upturned elephant trunks, is covered from the ground to its highest tip by thorns about an inch in length, disposed of regular spirals about an inch or two apart. Between these thorns, and just about the same length, grow small, oval, flat leaves, with the consistence of soft leather.

The pastures are, however, of greater interest than the bush, and these I must now describe. There are in this part of the country two entirely distinct types of pasture. The one which seems to belong to the calcareous and sandy regions appears to be ideal pasture for sheep. In fact, the natives call it "voln'ny ondry," or sheep's pasture; it is short and sweet. The other is found mostly in granite regions and generally on eruptive soil. It is called "danga," and is to Madagascar what the spear grass is to Australia. The seed is not more than about

half an inch in length, but it bears a long thread-like appendix. Native sheep having no wool, do not seem to suffer from the danga, while bullocks, owing to their greater height, only collect it while grazing, and that around their horns and eyes. If it gets into the eye it may, of course, be dangerous, yet, broadly speaking, horned cattle do very well on danga.

Monsieur S. L. Roussel writes me : "The land on which I settled at first was right in the middle of eruptive and granitic hills, and renowned for its good pasture. The sheep—both native and imported Merinos—did well at first, and my shepherd was delighted with the abundant and rich growth of wool. April came round, however, and with it the seeding season of the danga. We soon saw that there was only one safe course, and that was to keep the Merinos in. For one of them, however, it was already too late ; internal inflammation had set in, and he died after a week's illness. This was my No. 1, a full-folded Rambouillet, bought from the French National 'Bergerie.'

"I had, however, already looked round and found that between the mountains of Ambia, where I had settled, and the sea there was a region of beautiful pastures, covered with voln'ny ondry, and my arrangements were complete to transfer the flock there.

"This transfer was no small matter. What with two cart-loads of purebreds, that were too lazy to walk and too valuable to risk on the road, a load or two of lambs which were too young to walk, and some three hundred ewes, most of them in lamb or with young, the comparatively short trip—only about sixty miles—took the best part of a week. The crossing of the Mananare and of the Mandrare Rivers were the chief events. The Mandrare is a broad but not very deep river, where the native ewes had the opportunity of showing off their swimming abilities, while the purebreds were passed in a native 'lakana,' or pirogue, cut out of the trunk of a single tree.

"This part of the country appears to be all that can be desired for sheep. The grass is good, there is enough of bush to provide shade and shelter—very little or none of the thorny species described above. There is practically no running water, but a fair supply of good water can be secured underground by digging to a depth of from 20 to 40 ft. As the natives will

undertake to dig such a well for you at the contract price of three young bullocks, and you can secure those for 30/- to £2 each, the undertaking is not ruinous. Well water is, however, only used here for domestic purposes, and sheep and cattle—except cart oxen—are never given water. The fact is that the abundant dew which they get on the grass in the morning is quite sufficient for them. An abstemious breed has thus been evolved under the special circumstances obtaining here, and this remark applies to man as well as to animals. Many villagers have to walk three hours or more to the nearest water, and yet they remain on the hill or in the bush when they might, if they cared, move nearer to a well or a river.

"The rainfall here is irregular, and the land being light and sandy, I must provide for periods of drought. This I am doing by sowing some of the various forage seeds which during the last drought have proved so helpful in South Africa to the few farmers who had sown them—phalaris bulbosa, paspalum dilatatum, festuca elatior. I am also trying saltbush, teosinte, cowpeas, and velvet beans.

"The appearance of a plough, or 'oxen spade,' as I describe it to the natives, has caused a great sensation. It is, however, as new to the oxen as to the men, and it will take a little time until our oxen can plough a straight furrow.

"The real difficulty as regards land is that of securing any large freehold or even leasehold grazing land. All land is open to allcomers, and as the population, though not very large, is pretty well distributed over the whole country-side, it is difficult to secure from the Government the exclusive use of any large area.

"You will no doubt inquire, 'What about the native sheep and cattle?' Sheep are fairly large and strong, mostly white, with black or brown spots. In first crosses with Merinos there seems to be very little black, mostly white and brown. As far as I can judge at present, the brown is short kemp, while the longer wool is white. Thus a lamb which is quite brown at birth, when it seems to be covered with only native-bred kemp, may get quite white in time, when the wool appears.

"As far as I can judge, both from the experience of British East Africa and from the products of experiments started a

few years ago in this country by a Government 'vet.,' the second cross is a great improvement on the first. In fact, I have seen two absolutely distinct types of crosses resulting from the experiments made in this country. One has white wool and short brown kemp on the back, and only brown kemp on the belly ; the line of demarcation between the two regions is quite definite. Those sheep I take to be first crosses, viz. halfbred, or crosses between halfbred.

"The other type has very little or no kemp on the back, and has also the belly covered with wool. Those are, I suppose, second crosses, viz. three-quarter Merinos, and no doubt also sometimes crosses between halfbred, which have taken the Merino characteristics both from sire and dam. Unfortunately, the vet. who started those experiments—and who is now dead—was not able to carry them on himself, and distributed his small flock amongst the military and other Government officials of the various surrounding stations. There they multiplied, and were appreciated on account of the superior meat they provided the 'mess' with, but systematic breeding was discontinued, and no record kept of the crosses.

"What I have seen of these small flocks goes to show, however, that improvement in the wool can be rapidly secured, but also that with indiscriminate breeding there can be an equally rapid reversion to the native type. I have seen in these flocks sheep which I was told were crossbred, but which I certainly would have taken for pure native.

"I tried at first hand-serving, and kept the rams separate from the flock. I found, however, that this was very slow work, and that the ewes were somewhat terrified by their unaccustomed mates. I am, therefore, now letting the rams and ewes run together, and breeding proceeds apace.

"Summarising, I think that there are excellent prospects in this country. The land difficulty may make it necessary to adopt another system than in Australia. In fact, I am now considering a scheme for working hand in hand with the native—I providing the rams and they the ewes and the pasture under their own supervision. I would thus limit myself to the breeding of stud rams, for which sufficient land can be secured. This or some other method must be evolved for

getting round the land difficulty, as this country appears to have great possibilities for wool growing, although, as far as I know, it does not so far export one bale or even 1 lb. of wool."

Mr. W. Sutherland, Ambohijanahary, Ambatondrazaka, Madagascar, writes me that there are scarcely any English cattle-breeders in the country. He says: "There is the Cie Generale Frigorifique à Majunga. The manager is an Australian, and there are a number of Englishmen and Australians employed there. The cattle are at present nearly all owned by natives, excepting a few owned by Frenchmen. Cattle are still cheap here; bullocks fattened on manioc, and giving about 660 lbs. of meat nett, are selling at £6, while those fattened on grass, and giving about 440 lbs. of meat, sell at about £4."

Other French colonies from which supplies of cattle can be procured, and where they are only awaiting good modern methods to increase in numbers and quality, are Algeria, Camboa, and Senegal.

There is a freezing plant, known as the Lyndiane works, in Senegal, on the West Coast of Africa, belonging to the French. During the latter half of 1916, 13,198 quarters of frozen beef were shipped to the French military authorities. The hearts, livers, brains, tongues and kidneys were also frozen and shipped to France in 95 lb. cases. There are great prospects for Senegal when good stud bulls are imported and scientific breeding introduced.

Mutton Exports to France

According to a report of the Marseilles Chamber of Commerce, the North African colonies, Algeria and Tunis, exported to France supplies of mutton estimated as follows: 1909, 1,120,729 sheep; 1910, 1,256,908; 1911, 968,304; 1912, 812,865; 1913, 1,286,985; giving a total of 5,445,791. This makes an average of 1,089,158 sheep per year. During the war the exports were: 1914, 711,126; 1915, 1,176,412; 1916, 861,695; 1917, 659,136; 1918, 300,000; totalling 3,708,369 sheep. This gives an average of 741,673 sheep per year.

MOROCCO

This country is a surprise to those who take the trouble to visit it. Recently a friend of mine from South Australia, Mr. R. G. Young, a thoroughly practical man, was engaged by the French Government to report on its pastoral and agricultural possibilities, and in an interview I have had with him on his return said : " I travelled over 3,000 miles during the two months I was there, always by motor, and found good to excellent roads most of the journey. I found much of it covered with herbage, with excellent native salt bush at places, and with wild flowers in profusion. A very large area, in fact 7,000,000 acres of cultivation : wheat, oats, barley, maize, peas and beans. I have never seen such prolific crops of the two latter. There is another 10,000,000 acres fit for cultivation and a balance of about 8,000,000 acres too stony or arid, but none of it could be called real desert country. Thirty thousand tons of beans, 6,000,000 bushels of barley, and 1,500,000 bushels of wheat were exported to France last year.

" No machinery at all is used, all the work is done by hand with the old-fashioned flail for the thrashing. I covered 360 miles north and south with a depth of 120 miles from the sea to the ranges. This area has a rainfall averaging from 12 to 30 inches per annum ; it is very regular, and droughts are rare. The land rises gradually from the sea to the ranges, which average 12,000 feet at the highest point. Abundant water is to be found over most of it, with good rivers and sub-artesian supplies at from 15 to 30 feet on the lower levels. One of the most striking characteristics is the heavy dews. These occur almost nightly, and soak one to the skin. There is very little grass of any sort. I think the reason for this is that the country swarms with snails and these have eaten it

out during past years. They, however, can be easily got rid of by cultivation. There is almost an entire absence of trees. On the ranges, however, cedars are plentiful, and on one part in the north there is the forest of Marmora, consisting of 300,000 acres of cork elms.

Live Stock

"There are 6,000,000 merino sheep and 1,000,000 cattle, a small beast showing distinctly a Jersey type. The sheep are poor specimens in type, giving about 3½ lbs. of mushy wool, without character with a pre-war value of about 1s. to 1s. 1d. per fleece. The sheep industry is carried out in a most primitive way, rams and ewes mate when they like, and lambs come at all times of the year. No castration is performed, and the result is what practical sheep men can expect. At shearing the animal is tied and the fleece removed with a crude pair of scissors; the belly wool is never removed, as the natives believe it keeps the animal from catching cold. There are few or no diseases in the country, a little lung worm among the lambs, and a little tick and red water among the cattle, but nothing of serious moment. The natives earn 3 francs a day, about 2s. 4d., and are very ready to learn new methods. They work well if watched, but are fond of gossip and talk whenever they get a chance. I castrated a few sheep and some calves for their edification; it was wonderful how quickly they seized the idea and the method of doing it.

"There is no fencing in the country; all the stock are yarded at night, but there are no wild animals to injure them. The cattle kill at about 450 lbs. Large numbers alive, with sheep and pigs, are shipped regularly to France. Negotiations are being entered into with a firm to erect freezing works at Casablanca, or some other port on the coast, and doubtless, in the future, there will be a substantial export of frozen meat. The pig industry is large; pigs are to be seen everywhere. They live almost entirely on truffles and snails, and the flesh is delicious. A big trade could be built up at once in frozen pork. There are almost unlimited possibilities for the industry.

"Poultry is another very large industry. Millions of eggs

are sent monthly to France ; they cost about 9d. per dozen at the ports. All the natives keep fowls.

Land

"At present land is not procurable, but the French Government is making arrangements whereby in two years very large areas will be thrown open for practical stockmen and farmers from other parts of the world. Merino rams from Australia should be introduced, and the weight of wool per sheep can be largely increased and the quality improved. Judicious imports of grade cattle will vastly increase the weight and quantity of the cattle, and numbers can be easily quadrupled.

"Morocco is only a few hours' steam from the southern French ports, and refrigeration when introduced will largely increase the food supply of that country and the prosperity of the Protectorate. France has a very valuable asset in Morocco."

BRITISH EAST AFRICA

THE rapid development of British East Africa is little short of marvellous in view of the many difficulties with which settlers have had to contend. To the Imperial East Africa Company is due the credit of first opening up the country, but after years of struggle its charters were surrendered to the Crown, and some eighteen or nineteen years ago the only importance the country had in the minds of outsiders was derived from the fierce political strife which took place over the construction of the Uganda railway as a backdoor to Egypt. This undertaking was derided as a useless waste of money which would never bring an adequate return, yet within ten years of its completion it earned nearly 2½ per cent on its extravagant cost of over £5,000,000, in 1913 it earned 3½ per cent, and since then it has been increasing in prosperity yearly. It is now inadequate for the needs of the country. The main line has a length of 584 miles, and links the Indian Ocean with Lake Victoria Nyanza, upon which is a fine fleet of steamers. Feeders or branch lines have come into existence, and further extensions are being carried out.

The climate, although the country is on the Equator, is magnificent. This is accounted for by the fact that the area suitable for white settlement consists of vast tablelands running up from 4000 to 9000 ft. in height, and culminating in the perpetual snows of Mount Kenia at an elevation of over 16,000 ft. These tablelands are of great fertility, blessed with an abundant rainfall, and in little more than fourteen years over 7000 white people have made their homes in a country which for centuries supported nothing but savages and teeming herds of game. Civilisation now exists in the midst of savagery. A scantily clad native may be seen intelligently using a telephone or seated in his master's motor-car. The settler when tired of

working may take up his rifle and shoot a gazelle for meat, or seek the excitement of a battle with elephant, lion, or rhinoceros, and then return to his comfortable club or electric-lit home !

Fourteen years ago land could be bought or leased from the Government at a nominal figure, but settlers found it hard to make both ends meet owing to the absence of markets for their produce. Picked farms changed hands for a mere song, and many were surrendered to the Government. To-day well-developed coffee and sisal hemp plantations are yielding rich

CONGONI, SHOT BY MR. DUNCAN CARSON

returns to their owners. Thousands of acres are under wattle, maize, wheat, and beans. Sawmills are at work in the forests ; orchards are yielding their fruit. Probably there is no richer pasture in the world than exists in some parts of British East Africa, and the many stock diseases which used to be rife are rapidly disappearing before scientific investigation and treatment. Inoculation provides immunity from rinderpest, dipping prevents the dreaded East Coast fever, and to-day it is found possible to graze highly susceptible imported stock where a few years ago the hardier native cattle succumbed. There seems little doubt, therefore, that the highlands of British East Africa are likely to develop a great cattle industry.

Fourteen years ago infrequent steamers dropped casual passengers in Mombasa. Two trains a week ran up to the highlands, and for several years in Nairobi the trains were an event of such importance that clergymen protested against one of the trains arriving on Sunday in that it drew away nearly their entire congregation! Nairobi consisted of the Government and railway offices and quarters, one or two white tradesmen, the bazaar, and a few other Indian shops. Metalled roads there were none outside the railway quarters. The Government road, though laid out, was a quagmire bordered by a few beginnings of buildings. So little did some people believe in East Africa that a deputation of prospective settlers was informed by the Provincial Commissioner that British East Africa was not a country for white settlement, and that they were not wanted!

Turning to the land side of the question, wonderful advance is shown. In 1904 the majority of the settlers had their holdings in the Kyambu district, and even in that fertile area many found it impossible to make both ends meet. Land was practically valueless, and quite a large number of farms changed hands for a mere song, or were surrendered to the Government. It is true a slight boom set in during the year owing to the rapid influx of new settlers, but when the subsequent reaction came things were worse than ever, and the optimists of the country could have easily been counted on one's fingers. Up-country the position was almost worse than round Nairobi; quarantine had brought the stock trade to a standstill; depression was everywhere. Land then to be had for the asking has increased in value by leaps and bounds until improved Kyambu coffee farms have changed hands at over £25 an acre, and unimproved land at £12 and over an acre. Many of the big grazing areas throughout the country have proved valuable agricultural lands, and have been split up into small blocks selling at up to £2 and £3 an acre. Everywhere a steady increase in values has taken place.

However, it is no place for a man without capital, all manual labour being done by natives or Indian artisans. On the other hand, it offers great attractions to the young man of moderate means, and enterprising enough to grapple with new conditions.

Sheep are of a very poor class, being mostly grades between the native ewe, fat tailed, and the purebred Merino ram. Purebreds imported direct into the country do not do well, and apparently it is not advisable to bring in high-priced rams, for they deteriorate tremendously. A ram carrying a good dense fleece, with good character and plenty of staple, will in twelve months' time develop into a haggard-looking creature, with short, hard, weak, and altogether bad wool. If in a show a £100 ram were awarded 95 points, and a £40 sheep secured 70, then under similar conditions, in a short space of time they would both be reduced to about 30 points. Again, should the progeny of a high-priced ram be very good, it also seems to go back later on. Therefore, at present, it is too early to pay high prices for sheep. Some farmers have gone in for the purebred Merinos, which were imported from South Africa, but, as compared with the grades, they do not do well. The most favourable results are obtained from crossing the Merino ram with the native ewe, for the mothers are acclimatised, having been in the country many years, which, of course, is a great advantage to the offspring. Then, again, the Merino ram is crossed with the halfbred, and so on until it is exceedingly difficult to distinguish a fourth cross from a half Merino. Stock-owners have not gone much further than this, for the sheep industry is still in its infancy, but in those few instances where they have reached the fifth and sixth cross, the owners are not well pleased, for they say that the lambs are mostly very miserable and difficult to raise.

It is not surprising that sheep do not do well, for in the first place good sheepmen are exceedingly few, whilst the conditions under which sheep live are far from being desirable. The rule is for one or two " boys " to herd a mob of about 1000 during the day, and for one " boy " to watch them at night. The sheep are generally put into " bomas " (brush yards) at night, and unless these " bomas " are frequently changed, they get into a filthy state. It is often the case that they are not renewed as frequently as they should be, with the result that the sheep have to camp on what is practically a manure heap.

Three great things to contend with are disease, stealing, and wild animals. There are many diseases from which sheep

suffer, including scab, tick, wire-worm, nose disease, and blue tongue, but by plenty of attention most of the disorders can be kept in check. The stealing, which is carried on by the natives, is perhaps worse than anything else, and is, indeed, very difficult to deal with, for it is mostly done during the night, and the trouble is that one's own herders are often "in" with the thieves. The wild animals are becoming fewer as the country gets more settled, but still they account for a good many deaths.

Cattle do very well, and there is no doubt that this will some day be a great cattle country. Excellent results are obtained by crossing native cows with purebred bulls, and it is astonishing that the hump that is so prominent in the mother is, in the majority of cases, entirely lost in the progeny. The worst diseases amongst cattle are East Coast fever and rinderpest, also gall-sickness is troublesome. By systematic dipping, East Coast fever can be absolutely avoided, and with stringent quarantine laws, and by inoculation, rinderpest can be kept well in hand. In the majority of cases gall-sickness can be cured. Native cows sell at prices ranging from £6 to £9, while halfbred cows sell from £15 to £20.

Between Nairobi and Sultan Hamid there is very good country for stock in many parts, particularly the Athi plains, but the ticks are so plentiful on these plains that without regular dipping stock would fare very badly there. The very large herds of game on the Athi plains are an excellent proof of the good qualities of the grasses there. There is a grass on these plains almost identically the same as Rhodes grass, but it does not grow as high as this famous variety of the dub grass.

There is no doubt that the Athi plains will some day carry large herds of cattle. The carrying capacity of this part is very high, but the grasses are rather inclined to be watery, and the stock fattened here will not have good kidney fat. The condition generally will be soft without artificial feeding, and stock will quickly lose their condition if travelled far by road or rail.

The rainfall at Athi River Station averages about 25 inches. Around Nairobi the country generally is too valuable as coffee land to think of using it for carrying cattle.

Further west beautiful country is found at Naivasha and

Nakuru, and cattle do very well indeed there, but as many parts will become valuable as coffee lands probably cattle will not be raised in large numbers. The rainfall at Naivasha averages 25 inches, and at Nakuru 35 inches, so the grasses are generally very green and look beautiful, but they are watery, and hard condition on stock cannot be expected without artificial aid. The carrying capacity is high here also. Dry countries are always better cattle countries than wet countries. Grasses always contain more nutriment in the former.

There are many parts of British East Africa spoken of as being good cattle country that lie to the north of the line after passing Nairobi.

The best fattening country in British East Africa is around Mouyuni and Maktua, and to the north of this part. The country there is very dry, but the grasses are full of nutriment. Water is very scarce in these parts. As regards "German" East Africa, the good cattle country seems limited to a small area comparatively. The country around Iringa is really good cattle country. There are no tsetse flies there, and it is supposed that horse sickness is unknown.

Now the war is over there will be a great demand for stud cattle for British East Africa. The first thing that impresses the newcomers is the varied character of the plains and the quality of the herbage growing thereon. As one gazes from the window of the spacious coaches of the Uganda railway, which traverses the whole length of the Protectorate, one sees vast expanses of veld equal, if not superior, to any in South Africa, teeming with game of all description, giraffe, zebra, and a dozen varieties of antelope, all "fat as butter," and all apparently in excellent health. Here and there, at certain seasons, may also be seen vast mobs of cattle and sheep belonging to the Masai, a very wealthy pastoral community. The best cattle country in the Naivasha district is to be found on the Kinangop Plateau, a tableland lying between the Lake and the Aberdare Mountains, at an elevation ranging from 7000 to 9000 ft. above sea-level. The farms on this plateau average 5000 or more acres each, and excellent work has been done during recent years by use of purebred bulls upon the native

stock. One end of the Kinangop Plateau forms part of the big tract of 500 square miles owned by the East African Syndicate. West of this, and extending from within a few miles of Gilgil up to Laikipia, the former home of the Northern Masai, lies a magnificent tract of country eminently suited to cattle.

Much of this country lies at an elevation of 9000 ft. above sea-level, so that the cold nights encourage the growth of plenty of hair, whilst disease is almost unheard of, which renders dipping unnecessary. The farms in this district are large, and subdivision is gradually being effected by some of the owners, so that a few years hence much of this land should carry its full share of stock. The herbage is all that cattle can desire, red and white clover being abundant, in addition to a great variety of natural grasses.

Reference must be made to the native stock of British East Africa, for it is upon the native breeds, which are most unpromising-looking beasts, undersized, with drooping hindquarters and of all colours, that the improved Asiatic Zebu or humped breed are first set to improve. These cattle are hardy and good breeders, and soon fatten upon grass alone. They live out of doors in all weathers, and although, as already indicated, their milking qualities have been impaired by generations of mismanagement, the milk is exceedingly rich in butter fat. The lactation period is short, but in spite of its failings the native cow responds to efforts for improvement in a truly marvellous manner.

The result of the first cross with a bull of any pure breed is almost invariably a calf which is scarcely recognisable as the offspring of its mother. The hump disappears, the hindquarters become straightened out, the ribs are better sprung, and more often than not the calf shows the character and colour of its sire, whilst in size it far surpasses any of its low-born relatives. These calves thrive and grow rapidly, and at two years of age are worth practically double the value of their dam. Of course, the improvement effected by the second and third cross is not so clearly marked as the first, but so much do the offspring partake of the character of the purebred parent that it is frequently almost impossible to distinguish a three-quarter from a purebred heifer.

Mr. Duncan Carson, of Sydney, wrote lately in *The Pastoral Review* as follows :—

" Paying a visit to British East Africa for the second time, one cannot fail to be struck by two facts—one, the marvellous increase in the values paid for land, the other the want of justification for such an advance, the exception being land suitable for coffee. With this crop, returns from the few plantations

Mr. McGregor, Manager of The Naivasha Stud Farm, B.E.A., and Serval Cat

which are bearing, it is stated, show profits of over £40 per acre, so high values for the land are justifiable.

" On the occasion of my first visit what struck me as curious was the great amount of faith held by practically all the settlers in the future of the country, and the extremely rare cases where they (the settlers) were attempting to justify this faith by bucking in in raising stock or crops to show the returns the land was capable of producing.

" Strange as this may appear, this remains one of the curiosities of the position. Many of the settlers, both young and middle-aged, appear as if they took up the land with the ex-

pectations of making a good rise out of the unearned increment, not with the desire to secure a good income from the products of that land, and show little desire for real hard work.

"As in all new countries, it is the man, young or old, who is capable of turning the land to best account, either by hard work with his hands or brains in directing his labour, who is of the greatest value to the country.

"Unfortunately, many of the settlers appear to think that by habiting the land, by running a few head of cattle or sheep, or by cultivating a small area, they are doing all that can be expected of them. Many even do less than that. For these men it has been fortunate that the land speculators have come along and given them high prices, but it is unfortunate for the next man who desires that block that he has to give the speculator his profit and pay a price when there are few actual returns from the property, in some cases no returns, to show what is the real value of the place. Interest is at a high rate, and money is borrowed from the private lenders at from 10 up to, I believe, 15 per cent, so that only high returns from the farms would justify the prices, from £2 up to £3 per acre, which are paid for grazing propositions.

"Taking a rough and rapid survey of the position, it means that the country even yet has not settled into its stride. Some few, probably thirty, in British East Africa, are doing well out of coffee. Some few—probably a dozen—are doing well out of sisal hemp. Others make returns from butter, the sale of surplus cattle and sheep or produce.

"At the time of my former visit the country for British East Africa was very dry, but the quantity of grass that clothed the pastures of this visit made the country very attractive, but it would require a long sojourn in the country before one could say which were the grasses most suitable for stock, as settlers in different districts have widely different ideas as to the feeding virtues of the different grasses, herbs, and shrubs, and also as to the carrying capacity of the land. An Australian used to the carrying capacity in Australia naturally forms his own idea, but that is best kept to oneself; but, taking it on the whole, British East Africa is more a cattle country than, at any rate, one for Merino sheep.

"There are some small areas near Naivasha, and to a much larger extent the country in the Southern Guaso Nyiro, now held by the Masai tribe, which an Australian would consider good grade Merino sheep country; but the Masai country is not available, and I did not see the other districts, where reports say Merinos would thrive—at any rate the area is limited.

"The Merinos require drenching fairly frequently for wire and tape-worm, and are all dipped, but looked very well indeed at the time of my visit.

"The settlers are keen on getting grade bulls for crossing with the native cattle, and give £50 and over for bulls that few Australian breeders would look at, whilst purebred Shorthorns of quite moderate grade would realise 60 to 90 guineas. Unfortunately, I did not see Lord Delamere's herd, but I understand it is of a high grade, but several of the more enterprising settlers are getting quite nice herds of pure and grade cattle that seem to do well on the natural pasturage.

"What appealed to me in shooting through the large Masai reserve in the Southern Guaso Nyiro, and seeing the very large herds held by that tribe, was that it would be well worth a settler's energies to get a pick of the native Masai cattle, select a good bull, and then start and improve that breed. There is plenty of room for it, and one is encouraged in this, as, were one to select, say, the top 20 per cent out of the huge herds held by the Masai, one would have a lot of excellent animals of that breed, valuable not only as beef oxen, but also as trek oxen. The Masai, whilst sometimes using good bulls, frequently breed from a bull because they fancy his colour, which is generally a freak, such as spotted black and white or one with some brindled markings; whilst many of the dun-coloured, or reddish brown, or fawn-coloured animals are quite attractive, and would be the type to maintain and improve.

"Whilst the country has not yet got into its stride, and will never be a country for large individual herds, it undoubtedly holds great possibilities of quick advancement for the young man who can keep away from the Nairobi and Nakura bars, and will be content to put in some good solid work in making a home for himself. Formerly the diseases in the cattle were

enough to frighten the intended settler, but rinderpest, I was assured by the Government expert, was readily held in check by inoculation, whilst the dreaded East Coast fever is quite easily stopped by dipping the cattle every three days for a period of six months. For an Australian this seems a lot of work, but as a settler with 300 to 400 head of cattle is looked upon as having a large herd, the dipping takes the native herdsmen (who become quite expert at putting the cattle through) from an hour to two hours. One good advance has been the erection of these dips at the various farms. Unfortunately for the employer of native labour, the introduction of so many of the Indian coolies has caused the adoption of their intensely slow methods of working. If a road is being made the material is carried in small baskets, mostly put into basket by hand, and then carried at a very slow walk (about a two miles per hour rate) to its destination. To make the most of the available labour this wants altering, though it will take a strong man to do it, but it would make the labour twice as efficient. Labour is much dearer than formerly, but still ranges from 6 to 8 rupees a month with food (posho), costing, say, 3 rupees average, or well under a pound a month, including food. The hours worked vary a great deal, and one settler gets on with his labour much better than others, but it can be taken as a fact that labour is getting dearer and more difficult each year. At the same time, the better men are becoming more efficient. After all, the natives do not require much money. The young men want sufficient to buy one or two wives—the elder men more wives, so that they can retire from work, and get their shambas (cultivated plot) worked by their wives. With most tribes it is the wives who do the heavy work.

"The country, where the elevation is over 5000 ft., is mainly a very healthy one for Europeans, the climate delightful, with very slight variations the whole year round. At the lower levels and in Uganda, of course, fever is prevalent, and the European has to take considerable care to avoid mosquitoes and fly bites, and thus keep as free as possible from malaria. In Uganda, which I did not visit at this time, the prospects are stated to be very great for coffee, rubber, and cocoa, whilst cotton affords a not very high return. To one who is tired of

the never-ending socialistic trend of Australian politics, British East Africa offers not only the prospects of a very remunerative field for his energies, but at the same time a very healthy spot in which to spend his days whilst he can indulge in big game shooting to his heart's content."

Red Poll Dairy Herd, Property of Mr. J. E. Quested, Kent, England

SOUTH-WEST AFRICA

In this part of Africa, until recently owned by the Germans, there are excellent grazing lands in the higher country. The Herrero tribe are nomadic cattle owners, and possess large herds in Damaraland. It is almost purely a pastoral country, agriculture being confined to the territory around Grootfontein, Amboland, and the Okavango Valley. Since the rinderpest in 1897 the country has been practically free from serious diseases, and stock-raising can be successfully and cheaply carried out. Liebig's Company have recently obtained a big area of cattle country, which is a proof of its value. It is quite probable that under good government this country has a great future before it for cattle and sheep-raising.

In Egypt there are very large numbers of cattle, nearly every farmer keeping a few head, and these are fed and fattened on the luxurious fields of the Delta. During the last few years the Egyptian Government has taken steps to improve the quality and size of these.

Some seven miles out of Cairo, at Shubri, there is in existence,

Group of Young Cows (improved), by Ibn Shakei, 3 years old

under the able control of Mr. A. C. Branch, a large stud of thoroughbred and Arab horses, cattle, and sheep. This belongs to the Sultanieh Agricultural Society, and was instituted some years ago by Prince Hassan.

Accepting a kind invitation by Mr. Branch, I motored out recently to inspect it. The drive was interesting, as I passed through some of the richest land in Egypt, rented at £22 per acre, and worth up to £350 per acre. Every description of crop

looked in magnificent condition. Veritably Egypt is a land of plenty. On arrival I drew up at the door of a big brick pile of buildings, and was taken to see the stock. Mr. Branch's profession is that of improving the native stock, and I saw some most interesting results. Naturally, mistakes have been made, but that can be taken for granted. For instance, Norfolk rams were introduced into the native fat-tailed sheep, with the result that the tail was bred out; then it was discovered that no native would buy the sheep without the fat tails, so now they are busy breeding the tail back again. Egypt has very few

NATIVE BULL, IBN SHAKEI, 6 YEARS OLD

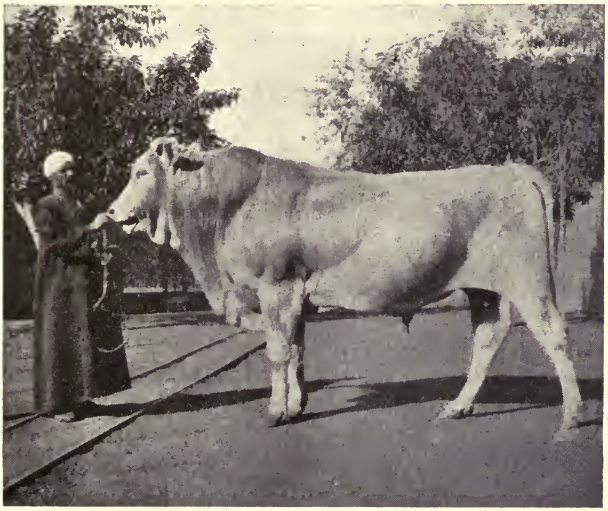
animals giving much fat, and the sheep's tails, which are almost entirely fat, giving up to 8 lbs. weight, are naturally of great value.

The first bull brought out for my inspection was a real corker, weighing 2226 lbs., a native bull of a light dun colour, called Diarb, seven years old. The next, a little darker in colour, and nearly as big, was Ibn Shakei, six years old. Then I saw a younger one, three years old, called Ibn Khalifa, and next a gigantic buffalo bull.

A group of very pretty three-year-old cows by Ibn Shakei quite took my fancy. A buffalo cow of enormous proportions came next; this cow gives four gallons of milk per day, with

8 per cent butter fat. I finished up the cattle by a view of several beautiful young calves, showing what vast improvement can be made in the native stock by judicious breeding.

The Soudan also promises to be a good country for cattle, and a port now in existence in the Red Sea will give it an outlet for the exports of live-stock and later on for frozen meat. There are great opportunities for the cattle industry on the Nile.



NATIVE EGYPTIAN BULL (IMPROVED), DIARE, LIGHT DUN, 7 YEARS OLD. Weight, 2226 lbs.

THE SHEEP IN EGYPT AND SOUTHERN PALESTINE

History

It is apparently doubtful whether the sheep is indigenous to Palestine and Egypt, nevertheless sheep history in these climes dates back many centuries. There are several Biblical references to sheep in Palestine, and in Egypt a species of sheep existed under the early dynasties, but appears to have become extinct about the Twelfth Dynasty, 2466 B.C.

The Breeds

There are about eight breeds of importance throughout Egypt and Southern Palestine. Some by cross-breeding are of recent evolution, and considered fixed types. Some sheep are wholly brown or black or white ; in other cases there are breeds and crosses for the most part white, but with black or brown heads and lower limbs and patches of colour on the body. There appears to be no set down points as to what a particular breed should conform with to meet the requirements of purity and fixity of type.

The most important breeds are :—

Saidi Sheep

A hornless breed, generally all black. Wool coarse and long. Sheep belongs to the district south of Assiut (Upper Egypt). Being a comparatively heavy wool producer, this breed cannot withstand hardships like the lighter-woolled breeds, and it is more profitably farmed on the irrigation areas.

Ebeidi Sheep

Another hornless breed, white in colour, and carrying what we would call a medium quality crossbred wool. The breed

is found in the district south of Assiut. The Ebeidi and Saidi are, comparatively speaking, thin-tailed varieties.

Rahmani Sheep

A horned breed, said to belong to Syria, from which country it has been introduced to Egypt, and flocks are scattered freely over the waste lands about the Nile deltas, where good grazing (good for Egypt) is available after the subsidence of the annual flood. The wool is long, generally brown, rather coarse and harsh, and inclined to run hairy on the tips. The tail is of tremendous size, and would weigh anything from 6 lbs. to 10 lbs. according to the general condition of the animal.

Ooseemi Sheep

The name is derived from the village of Ooseem, Gizeh. A general purpose sheep, and the most popular breed in Egypt. The body is white, skin white, but the points are more or less of a brown or reddish colour. The wool is shorter and finer than that of the above-mentioned sheep, and it fetches the highest price of Egyptian wools. The sheep is compact, and stands on fairly short legs, consequently the carcases always look well, and the mutton commands a good price. Rams of this breed are eagerly sought after. The Ooseemi and its crosses are met with throughout Egypt and Palestine and in parts of Sinai. The tail is very broad and very fat, with a short, curly, attenuated appendage.

Sudani Sheep

This goat-like sheep is the most interesting. I am acquainted with a stuffed specimen of the ancient Moufflon breed, which is considered by some authorities to be the progenitor of the Spanish Merinos, and indirectly of our Australian Merinos, but the Sudani breed is the real missing link in sheep history as far as appearances would seem to indicate. At the Cairo abattoirs the writer made a close examination of a few specimens of this unique breed. They stand higher than any sheep I have seen—3 ft. to 3 ft. 3 in. on the rump, which is always 2 or 3 in. higher than the wither ; moreover, this measurement

was practically on the skin. The legs are extremely long, thin, and badly fleshed. The barrel is gaunt, flat-sided, narrow-chested, no depth, and the spine projects. The head is uncommonly large and ugly, with protruding eye sockets, aquiline nose, and, as with other breeds, long lop ears. The neck is very long and thin, and the head is usually supported hanging down close to the ground. The tail is long, and tapers to the tip, which usually brushes the ground. The sheep may be a patch-work colour scheme of black, fawn, brown, and white, generally two at a time. Its covering is the nearest approach to donkey's hair I have seen. In length it is about an inch on the body, but increases to 3 or 4 inches on the tail and lower breeches. In winter this hair covering is supplemented by a growth of very fine and soft short wool, equal in texture to ordinary Merino. This supplementary growth was more in evidence over the loins, and at the time of the writer's inspection, early summer, the cobweb-like fibres were already coming away from the skin. This reminds one of early sheep evolution. The Sudani " wool " is set down as worthless. The flocks of this breed are so scattered, and the quantity of actual wool from each sheep is so small (only three or four ounces) that it is impracticable to obtain sufficiently large quantities to be marketable. Our soldiers refer to these sheep in many cases " as the goats which the Indian troops eat."

Incidentally it might be mentioned that in all Egyptian abattoirs sheep after slaughter are blown up by hand-bellows, the nozzle of which is inserted through a small slit made in the skin on the inside of the hind leg. The air does not escape, and the sheep's form swells to huge proportions. Arab boys apparently delight to beat the inflated forms with sticks in order to loosen the pelt from the superficial fascia. Without this treatment some of the sheep are as hard to skin as suburban tom-cats. The skin of the Sudani breed is very thick, and the pelts are more valuable than those of other breeds.

Animal fat is very scarce in this country, and a strong prejudice exists against a sheep without a fat tail, which is almost an essential to the sheep's existence under local environment. In times of plenty fat is stored up on the tail, and when food is scarce it is said that the sheep absorbs more or less of

this fat into the system. Similar fat-tailed breeds are found in Mesopotamia, Persia. Turkestan, and India.

Management

The fundamental laws of stock-breeding are not very widely known in this country. The Arab is so ignorant in this respect, and knows so little about wool and conformation that only very simple standards can be set him as a hint to the purity of any breed. He is guided chiefly by colour. One hundred sheep are considered a big flock for an irrigationist, and the average area held by native proprietors is approximately four acres. Those who possess very small flocks can hire rams or send their ewes away for service.

On the farm lands there are no fences. In Southern Palestine the boundary between neighbouring properties may be a shallow ditch, a cactus hedge, or an imaginary line linking up clusters of bulb plants set at regular intervals. The land is devoid of timber. On the irrigation plots of the Nile valley the boundaries are merely narrow footways, and on these areas flocks must be shepherded always. It is a common practice to graze sheep by moonlight in order to avoid the fierce heat of day. It is only during short periods in the year that there is nothing to graze, or that it would be impossible to prevent harm to some growing crop by so grazing ; then the sheep are closely packed in " zeribas," fashioned generally of palm leaves. Here in these enclosures a mere sustenance diet of grain is doled out. A zeriba may be a few miles away from the farmer's irrigation plot, as no space may be available any nearer.

For most of the year sheep have access periodically to bersim (a clover fodder crop like lucerne), weeds, cotton leaves, the stubbles of wheat and barley, and, in fact, the residue of all crops after harvest. By the way, there is very little lucerne grown in Egypt. Sometimes there is much vociferous argument among shepherds for the couch grass grazing along the banks of the main irrigation channels.

We cannot be sure of the normal conditions of sheep-farming in Southern Palestine, but we are certain that sheep are kept only as an adjunct to agriculture. One can only describe what one has seen of the remnants of the flocks about the villages

since military occupation. The boundary between Egypt and Palestine, which meets the coast line at Rajah, is a well-defined line of demarcation between typical desert country on the south and poor agricultural land on the immediate north. From Khan Yunis almost to Beersheba we saw one vast crop of barley, for the most part, and the first green country for over a year. All were enraptured, but its agricultural possibilities and carrying capacity under grazing are apt to be considerably overestimated. This country was " milk and honey" as compared with the sand-dunes of Sinai over which we had ridden.

The growing season and green season are short ; the grasses are few and of poor variety. A grass of the couch family appears to be the foundation, and this, if not eaten out by stock, would alone remain after the rest had dried and had been blown away. This applies to the country south of the Gaza-Beersheba line. Further north the country gets very rough and stony in places, but there are little flats and hillside terraces of very rich black soil, capable of growing almost anything. The best grazing country was found on the plateau east of the Jordan valley and between Es-salt and Amman.

The rainfall of Cairo is 2 in. per annum ; in Sinai and on the irrigation areas it is practically nil. Gaza, on the coast, is said to enjoy an annual average of 14 in. ; the rainfall is probably about 10 in. further south and inland. North of Beersheba the rainfall increases. The rainy season is short and seldom fails. Water is very scarce, and on account of the great surface evaporation artificial ground tanks, as we make them in Riverina, would not hold out. The Arabs have installed a system of stone and cement cisterns, bottle-necked in shape, and built so that the tops are flush with the ground. During the rainy season the storm waters are directed into these reservoirs, which vary in capacity from 10,000 gals. to about 35,000 gals. There may be three or four families drawing their domestic supplies from one large cistern, and in addition a couple of hundred domestic animals might have to be watered therefrom throughout the year. As these cisterns are filled but once a year it is obvious that the water must be very carefully fostered. Even in summer sheep and goats are seldom

watered more than once in three days in these dry areas of Southern Palestine. There are no permanent streams south of the Dead Sea. Along the Wadi Ghuzzeh there are shallow pools, which remain at a certain level on account of the filtration of water through the sandy bottom and from the precipitous banks. These sources of supply were invaluable to our Light Horse. One seldom sees a pump or any labour-saving devices on the farms.

The wheat straw and barley straw are conserved in shallow circular pits, and ensilage making has been practised in this country from time immemorial.

Sheep are not earmarked or de-tailed. The testes of ram lambs are crushed, and development of the organ ceases.

The general season for shearing in Egypt is July. The sheep is held in various positions by a couple of natives, and the wool is hacked off generally by rough-looking native-made blades. Some farmers who are near the main irrigation channels swim their sheep a day or two prior to shearing. A few breeds are shorn twice, and are also lambed twice during the year. Wool is always sold through a middleman, who usually ships to England, and makes an unfair margin of profit. Collecting depots are established throughout the land.

In Sinai one of the most interesting and extraordinary sights is the little market-place right out in the open desert, where Bedouins, as if responding to some " mulga " wire, congregate periodically to sell and exchange their products. Very little money changes hands ; most of the business is on the basis of " fair exchange no robbery." Sheep, donkeys, etc., are exchanged for wheat, barley, maize, etc. ; bargains are pressed to the last grain.

Environment

The environment of the desert will not permit of much improvement in sheep. To pack much more wool on the breeds found here would be to impair that extraordinary goat-like constitution, which enables these sheep to live out in the blazing sun, travelling all the while for days without water in search of food.

On the irrigation areas there is certainly room for better

sheep, not necessarily introduced breeds, but better conformed types of the fat-tailed breeds, if farmers would not try to keep more sheep than they can feed properly.

The Australian on leave is familiar with the scavenger sheep of the market-places and town streets. This lucky sheep is made the pet of the children ; he has the run of some filthy domicile, and under such contentment grows big and fat in a very short time.

I know of no more picturesque scene, typically Egyptian, and representing the very essence of rural simplicity, than that of a huge water buffalo browsing in clover and supporting (forgetful of his presence) a half-nude native child lying full out on the buffalo's back, on guard over the little flock, too contented to move for an hour.

Prospects

Stock-raising countries are faced with the fact that flocks and herds of the world in general are decreasing, whereas the demand for wool and meat is ever growing. Egypt is not a big meat-eating country ; mutton and beef are rather the foods of its very rich folk. The number of sheep annually slaughtered at the Cairo abattoirs averages about 270,000, and this figure represents 82 per cent of the total number of all animals treated there. The big meat-eating white populations of Europe are at Egypt's doors, and the great quantities of fodder which could be produced on the irrigation blocks of this wonderfully fertile Nile valley suggest almost convincingly that lamb-raising and mutton-raising would be payable propositions. Let us look into existing conditions. Apart from the smallness of the recognised living area, another drawback is that there is no grazing country or even open spaces adjacent to each irrigation block where sheep could be yarded and hand-fed. It is all or nothing here. It would be absolutely essential to tax the growing capacity of the land to its utmost, and to plant only the most suitable fodder crops in season. This would mean doing away altogether with the cotton crop and the sugar-cane crops, the two staple crops of Egypt.

Then, again, the native breeds of sheep are unsuitable for

export. It is very improbable then that sheep will ever supersede cotton in Egypt, but as an adjunct to good agricultural methods the sheep is destined to remain.

Sinai will ever be a "no man's land." Now we come to the open downs of Southern Palestine. There are, perhaps, many aspiring Palestine squatters in the ranks of the Australian Light Horse.

As in Egypt, so in Palestine, grain is more in demand as a commodity of trade than wool and meat. Wheat and barley can be put in and harvested so cheaply; there is an abundance of cheap native adult and child labour, so that the poorest fields show a profit. Under Turkish maladministration there was no freehold land other than house sites and small garden plots, and of the so-called leasehold land the lessee had no security of tenure, and the Government could walk in at any time, hence we see no improvements, no fences, no water schemes, no plantations of trees, and few houses other than those dilapidated mud huts dotting the landscape. Under new British land laws settlement will be encouraged, and cereal growing should make big strides. Sheep will continue an adjunct to dry farming, but under better conditions the breeds should improve. The squatter idea will be cut right out; it is unlikely that large areas will be held solely for grazing. Holdings will be fenced. It is almost certain that good supplies of artesian and sub-artesian water will be tapped throughout the country. Proper surveys will be made, and new roads and railways will cross the land.

For the identification of these native breeds of sheep and their local geographical distribution I am indebted to G. C. Dudgeon, Esq., and Mohammed Askar Effendi, of the Ministry of Agriculture.

NIGERIA

It is now some three years since the immense cattle reserves existing in Nigeria began to be discovered and appreciated. This appreciation first came from a man who travelled two and a half years in the cattle regions of Nigeria and a short way over the borders into French, and what were previously German, colonies. This was Mr. Speed, a man of wide experience, who not only carefully collected data from interviews with residents, district officials, and the more important chiefs, but also put his observations to the test in a practical way. He found that there were not less than five million head of cattle. Besides Sir Frederick Lugard, the Governor-General, Mr. Speed saw Mr. Bonar Law and Sir A. Steel-Maitland on this matter, with a view to securing adequate reserves of land to allow for collecting and fattening prior to railing to Lagos. This was the first step necessary for capital to be put up to secure the erection of refrigerators, etc.

As a result of his energies, arrangements were made between the Nigerian Company, Miller Brothers, and the African Association to finance the enterprise as occasion arose, and Mr. Speed went to Nigeria again to carry out the initial steps. Unfortunately he died soon after reaching Nigeria. Nothing has been done since the removal by death of this forceful personality, who from long experience in Australia and Rhodesia, was a great judge of cattle, who had, moreover, accumulated a vast deal of information regarding conditions in Nigeria, and had actually experimented on a fair scale in fattening cattle before railing them to Lagos. This man could, without doubt, have guided into existence a vast enterprise, had he lived. An able man whom Mr. Speed sent out, a Canadian, Mr. Claude P. Evans, has spent over a year covering the ground previously

traversed by Mr. Speed, and fully confirms all his findings. Undoubtedly there is in the country a great natural cattle reservoir, and in view of the growing scarcity of meat, it is to be hoped that steps will be taken by British enterprise to foster this new and great source of supply.

GROUP OF STUD HEREFORD COWS AT THE ROYAL FARM, WINDSOR, ENGLAND

ABYSSINIA, SOMALILAND, AND THE CAMEROONS

Abyssinia, Somaliland, and the Cameroons are all countries with more or less native stock, which are all open to improvement. On the high and healthy plateaux of these countries there is ample feed for stock, and the climate is excellent.

CHINA

As new countries enter the frozen meat exporting arena, and China amongst them, Hongkong, which has long been a meat producer, may be expected to come to the fore. Last year, for example, her meat product exports to the United States of America were valued at £28,000, as against only £15,000 in the previous year ; while she also sent meat to the Philippines valued at £78,084, as against £96,762 worth in 1916. Frozen beef figured among her exports to the Philippines, although this ceased with the rise in the exchange which later eventuated. With the return of exchange to a normal level, the comparatively low price of meats in the immediate neighbourhood and the comparatively low cost of labour will doubtless make it practically impossible for American packers to compete with local interests save only in fine and special products.

The Hongkong Dairy Farm Company, Limited, for a considerable period has been experimenting with the packing of meats of different sorts for use in outports and aboard ship, including the tinning of beef and various meat products. It is now announced that the business has passed the experimental stage, and that the concern is arranging to can meats upon a large scale. Already the company has secured practically entire control of the trade in hams, bacon, and similar goods along the China coast, and its goods have been successfully shipped to other parts of the world, including Great Britain.

It has been found by repeated experiments that conditions in the meat-packing trade in this field are vastly different in every way from those in Europe and the United States. The work done in Hongkong so far has been under the superintendence of a British meat expert of many years' experience, and practically everything undertaken on the basis of British practice has been a failure there until methods meeting conditions

in Hongkong were worked out. Such an undertaking as the one now being developed is likely to have an important bearing upon the sale of tinned American meats in that field.

Refrigerated steamers are shortly to be put on the route between San Francisco and Tientsin to carry beef from the Shantung and Honan provinces of China. The beef from these provinces is of excellent quality, and far and away the best in China. The quality of this Chinese beef compares, according to statements made by the veterinary of the American troops stationed at Tientsin, very favourably with the Australian beef, while the Russian authorities prefer it by far to the latter. The United States troops in the Philippines are being supplied with Chinese beef.

Recently several large steamers flying the French flag landed frozen beef at Port Said and Kantura from China. It was Manchurian beef of very excellent quality.

SIBERIA

Siberia was, prior to the war, advancing as an important factor in live-stock production. Petropavlovsk, on the trans-Siberian railway, was the centre of an immense cattle-breeding district, and consignments of beef have been made from that region. The number of cattle there rose from 360,000 in 1903 to 770,000 in 1909, and subsequently the advance has continued. Mutton will also be largely exported when the new ways of communication provide means of tapping the great outlying pasture lands, and as a proof of their importance the official returns show 2,000,000 sheep in Kirghiz Steppes, and 1,300,000 sheep in Akmolinsk, both areas being capable of greater development. In respect to such progress, however, the trans-Siberian railway, whilst traversing a rich pastoral zone, leaves some hundreds of miles to the south, said to be the most fertile lands of Siberia. The cattle-breeding industry there awaits the impulse of railway communication and settled government. Pig-breeding is of special importance, thanks to cheap and abundant food supplied by dairies in the Kurgan district, whence large quantities of bacon and pork are exported annually ; but the inadequacy of railway transit prevents, for the present, an extension of that trade.

An English firm has erected meat works at Barawei. Refrigerators have been erected at Semipalatinsk, and works are contemplated at Omsk. Stock and game are abundant and cheap, and the climate is favourable for the frozen meat trade, but what effect the last four years have had remains to be seen ; however, new blood may make things progress after the war is over.

The vast region of Asiatic Russia is practically a new country in cattle-raising, and has possibilities too numerous to be estimated. From 1905 to 1911 the number of cattle increased from 5,600,000 to 14,700,000. Russia was proposing to go in

very largely for mechanical refrigeration directly after the war. Numbers of cold storage buildings were to be erected in the principal cattle-growing districts, and receiving stations with cold storage facilities were to be installed.

I had intended visiting this country, and had received my passport from Earl Grey and letters from the Russian Government, when the war broke out, and I had to cancel the trip.

THE PACIFIC ISLANDS

THERE are several large areas in the Pacific Ocean where cattle-raising has been for years a successful industry, and at times

ZEBU BULL FROM SOUTHERN INDIA AND NOW IN SOLOMON ISLANDS ON THE MALAGTA PLANTATION

of scarcity in Australia some very fine cattle have been marketed from Fiji and New Caledonia. On one island in the Fiji Group there has been for many years a very large herd of

Hereford cattle, and every year stud bulls of that breed have been purchased in Australia.

The cattle fatten rapidly on the "Sensitive" plant, and obtain quick maturity. The drawback has been always the want of markets for the disposal of the bullocks. The peninsula, of about 100,000 acres, with rich pasture, on the French island of Tahiti, in the Windward Group, is an ideal spot for cattle-raising, and should be able easily to supply with beef all the ships calling there, and at times have a surplus for export. The same sensitive plant is to be found in luxuriance all over the island. Again, the Sandwich Group, of which Honolulu is the main port, has many cattle owners, and cattle do excellently there.

New Caledonia is a country of great possibilities. As a cattle-raising colony this French possession has a great future. There are already three meat preserving works there, two of them being operated by Australian capital.

One of the Paddocks on a Figi Estate

JAPAN

THE Japanese Department of Agriculture and Commerce is spending 30,000 yen (about £3000) annually on the rearing of sheep. This commenced in the financial year 1916–17. About 200 head of sheep have been purchased from England, and others from Australia and New Zealand, and kept on the pastures at Tsukisamushu, Hokkaido.

Should these renewed experiments in sheep-raising in Japan prove remunerative the authorities will take steps for the encouragement of this branch of agriculture among farmers. The Japanese authorities are apparently convinced that sheep-raising in Japan will turn out successful, but it should be remembered that much depends on the demand for mutton, which is not an accepted article of food in Japan.

INNOVATION IN MUTTON STOWAGE

33 Per Cent Saving in Space

The accompanying illustrations show how mutton is dealt with to save space. The carcase is treated as follows: The

Fig. 1

The top half inserted sideways in the lower, legs down.

Fig. 2

Showing where the carcase is cut.

mutton is placed on the rail and chilled for 18 to 24 hours. It is then cut into two pieces across the loin, the trunk falling to the floor and remaining in an upright position. The hind portion is placed sideways legs down into the trunk, and then frozen in the upright position. After freezing it is bagged and stored. Mutton treated in this manner, it is estimated, save from 25 per cent to 30 per cent in space, and much more weight can be got in a given space. It really means increasing the capacity of steamers and cold stores to a similar large extent.

DIPPING CATTLE

The Benefit and Practicability of Dipping Cattle on Large Holdings

Mr. E. E. D. White, of Bluff Down, North Queensland, writes me as follows :—

" It is over twenty years since ticks first made their appearance in the Burdekin waters, when we lost up to 60 per cent of our cattle from tick fever. Those that survived and their progeny became immune from the fever, and the immunity remains with the cattle on all country that continues to be badly infected with ticks. So there are practically no losses from fever now. But the extent of the loss we sustain annually through tick worry is not generally realised. Although most cattle stations now have dips, with very few exceptions, no systematic and methodical attempts have been made to deal effectively with this pest.

" After ten years' trial here we can emphatically say that in badly infested areas no investment offers such a reliable and quick return as money spent on dips and dipping.

" To gauge in some degree the extent of the loss we are sustaining, compare the number of cattle carried on these runs before and after the coming of the tick. The average is now about half that of former times. Convert that into terms of money to realise the loss to the community and State.

" It is impracticable at the present time to talk of eradication, because of the impossibility of getting financial aid from the State and the high cost of fencing. But the Americans have proved it possible by clearing 475,000 square miles between 1906, when the work was first undertaken there seriously, up to March, 1916. This task must be faced by us later, and because the conditions we will have to work under

may make this harder, it cannot be shelved indefinitely on that score. However, what concerns us vitally in the meantime is the necessity of suppressing the ticks and doing away with much of the poverty and mortality to stock now being caused by them. To undertake this work each one making the attempt will very soon have his own experience to guide him, but a few suggestions may not come amiss to those about to start.

"First, put in a good wide dip 6 ft. across at water line. This reduces all risks of cattle injuring each other to a minimum, and has every advantage over the narrow dip when working big mobs of cattle. With a good incline and big wide steps on the walk out, the weakest cattle can be dipped with little risk. The draining yard should be long, and from 8 ft. to 12 ft. wide. The cattle walk to the far end, and stand quietly without horning and knocking each other about. Dips should be arranged in such positions on the run that the cattle will not be driven more than 7 or 8 miles.

"The number of cattle that can be worked through one dip depends entirely on the carrying capacity of any particular area. But on the tableland, so far, we have found about 2000 the limit without having to drive too far. How often cattle should be dipped depends upon the nature of the country, for whereas on certain runs on the Upper and Lower Burdekin it is found necessary to dip every three weeks through the year, there are other places within the tick-infested area that find an occasional dipping suffices. In this men must be guided by their own experience. It is a bad policy to wait until the hair is coming off the cattle. Taking this tableland country, we find that after a good burning in the spring and rain following in November and December, the ticks are not much in evidence until the following April. It is not possible to dip regularly during the first three months owing to wet weather, but by April the wet season is usually over. This is the time, and from this on to July one can get good results from dipping. This is the very best time to work stock. The grass is good, everything strong, and the weather cool, and the ticks if unchecked are increasing at a great rate. Don't delay until the country is infested; catch them early while the cattle are strong and healthy, and keep the ticks off and the condition on,

and give the breeders a chance to weather a severe winter and dry spring. One dipping then is worth more than four in August.

"It is often contended that the losses from dipping weak cattle outweigh any gain. Our experience is quite the reverse. We never stopped dipping all through the 1915 drought, and not ten head stopped in the dip. Each dipping gave them a new lease of life, and we saved most of our breeders by it. Others say it is impossible to dip bullocks while fattening. This is wrong. It not only quietens them, and makes them better to drove, but improves their condition and weight. It is not advisable to put cattle on the road immediately after dipping. They should have at least five days' rest in paddocks. Calves can be dipped from two weeks of age upwards, but the strength of the dip should be less than the accepted standard. Although almost as much benefit can be derived from dipping on big unfenced runs, better results can naturally be obtained where they are subdivided and not more than 1000 to 1500 cattle carried in one paddock. This allows the mustering to be done cleanly and systematically. Where eight stockmen used to look after up to 20,000 clean cattle formerly with fair success, it requires treble the hands, at least, to work and dip effectively that number now. Six men can attend to 3000 or 4000 head. Bullocks require about one-third the attention that breeders do. Where no shoeing of horses is done (which involves a big addition to the work on basalt country) this estimate may not apply.

"Now to meet this big increase in working stock under these conditions—allow we save half the cows that die on the average annually from tick worry. This mortality on the tableland is about 80 per cent of the total females branded each year. The balance of 20 per cent (over the actual number if returns were forthcoming) are those cows sold and killed for beef. On a holding branding 2000 calves, instead of turning off 200 cows, which very few do in that proportion, they should be marketing at least 500. These extra 300 cows alone at present values would more than compensate for all extra expenditure incurred. Then take into consideration the holding would carry 50 per cent more stock with all the additional returns for an increased turn off and better class of bullocks."

CATTLE TICK ERADICATION

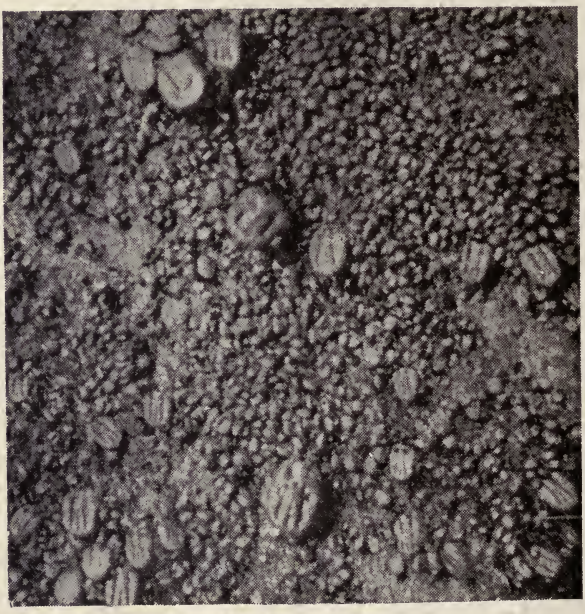
Of course, there are many methods of tick eradication, used either separately or conjointly, the more important and more generally known, however, being dipping, spraying, inoculation, burning the pasture, and starvation methods, the soiling method, the feedlot method, and the pasture rotation method. These are some of the means at the disposal of the cattle-owners, and a few words about each should be of interest and value.

Before dealing with the remedies, however, the dangers of the tick evil itself cannot be too strongly impressed. About four years ago the Bureau of Animal Industry (U.S.A.) issued a circular to stock-owners with a view to securing direct evidence regarding the benefits derived from the tick eradication work carried on within the quarantine area. This circular took the form of a number of questions which are given herewith with some of the summarised answers. They afford most impressive evidence, not only of enormous losses prevented, but also of immense gains obtained by the dipping of animals for ridding them of ticks.

In reply to the question, "What were the approximate annual losses of cattle from tick fever in your county from 1900 to 1909 inclusive?" the summarised answer was: "15·3 per cent," and this was followed by the query: "What has been the annual loss of cattle from tick fever *since tick eradication started?*" The answer—1·3 per cent—compared with the 15·3 per cent in reply to the first question, shows that tick eradication work resulted in the losses being reduced almost to vanishing point. The next two questions brought forth the information that whereas from 1900 to 1909 inclusive the average value of three-year-old steers was 16·15 dollars (67s. 3d.), in 1912, i.e. between two and three years after the commence-

ment of tick eradication work, it amounted to 25·28 dollars (105s. 4d.). In comparing these two amounts, however, allowance has to be made for the general advance in the price of cattle, but even when this is done, the price shows an appreciation of 40 per cent, which can be properly credited to the absence of the tick.

Two more questions and their replies may be quoted :—" Is



Ox Skin, showing Gross Tick Infestation

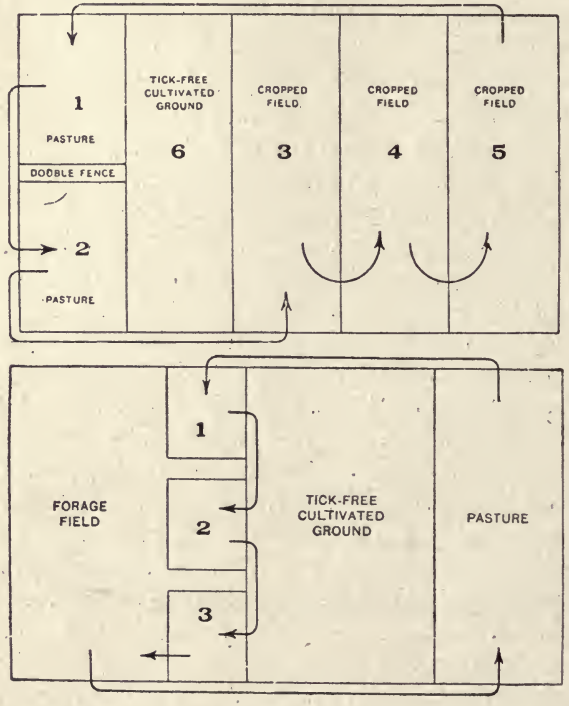
there any difference in the average weight of the cattle now and before tick eradication was started ? How much ? " Answer : " Yes. Average increase 22 per cent. Average weight increase, 116 lbs." Taking the value of the animals at $1\frac{3}{4}$d. per lb. (the average for three-year-old steers in U.S.A.), the average gain thus works out at about 16s. 8d. per head. Finally, the reply to the question : " Is there any improvement in the grades of cattle in your country since the work of tick eradication was started ? " was practically a unanimous affirmative.

These reports indicate very striking results, and the comment of a correspondent of the U.S. Department of Agriculture is worth quoting : " With the prospect of tick eradication, the raising of cattle is springing into life. In years gone by, with the tick depopulating bunches of cattle, there was no money to be made in raising cattle. With the present outlook, men are fencing their lands, and there is sharp competition for every heifer or cow that can be bought. If our authorities will pass a tick law, and see that it is rigidly enforced, we can clear out the ticks in twelve months."

To return to the remedies, dipping is undoubtedly the best method of eradication, provided an efficient dip be used.

Dr. Theiler (South Africa) has stated that the eradication of ticks by starvation " must undoubtedly lead to success in every case where we are able to keep the place, for a sufficient length of time, free from such animals as act as hosts," and that a period of fourteen months would be a safe one to adopt in attempting the eradication of the red, brown, and Bont ticks in South Africa by the starvation method. Careful experiments made at Gonubie Park, Cape Province, showed, however, that a fenced-in area of 160 acres, from which all stock had been excluded for twenty-one months, at the end of that period was still infested with a considerable number of ticks, and no doubt would have remained so indefinitely, owing to the insufficient barrier presented to the ticks by the fencing, and to the impossibility of excluding wild game. The conclusions drawn from these experiments, which included also grass burning, are that the starvation method reduces the number of ticks, and if combined with burning, still further reduces it, but that the method fails to eradicate the ticks, and is inferior to a system of dipping at regular intervals with an efficient dip. Burning doubtless destroys a number of ticks if it is done when they are on the top of the grass, but pasturage is usually such a scarce and valuable commodity in this country that burning it is rather too drastic a remedy. Also in regard to the starvation method it must be remembered that there are practical difficulties in the way of enclosing large areas so as to prevent ground game or birds gaining access to it, and bringing in ticks, besides acting as hosts to the ticks already on the ground.

With dipping and starvation combined, the ticks which get on the cattle are being killed off, and simultaneously those ticks which do not find a host are dying of starvation. Also, if a suitable dip be chosen, the ticks which get on immediately after dipping die. In other words, dipping means quick destruction of a certain proportion of the ticks, combined with the slower process of starvation of the remainder.



In the United States, where Texas fever, or redwater, is the only tick-borne cattle disease that troubles the stock farmer, the starvation method is said to have been practised with success.

The Soiling Method.—This is based upon the following data: The time required for the female tick to lay eggs and the latter to hatch—i.e. the time spent on the ground—is rarely less than three weeks, and the time required by the seed ticks to mature on the cattle is from twenty to forty-five days.

When the tick-infested cattle are to be cleaned it is recommended that they be kept in a small tick-free enclosure for three weeks, when many of the ticks will have fallen off. They should then be removed to another similar enclosure for another three weeks. After this, they should be examined, and, if found free from ticks, they may be put on non-infested pasture at once. If, however, any ticks are observed, the cattle should be placed in a third enclosure for another two weeks.

By this time the youngest ticks that were on the cattle at the start will have matured and dropped off, and, as the animals are removed from each pen before they could have become reinfested by the seed ticks hatched from the eggs of the females that fell off, they are tick-free. It is clear that the enclosures cannot be used repeatedly for the purpose without thoroughly cleansing them from ticks. It should be noted that this method, as described, is only suitable for dealing with the tick which carries the redwater organism, which requires to pass through the egg stage in its progress from host to host.

The Feed-lot Method.—This method is based upon the same considerations in regard to the life-history of the tick as the last. To put it into practice, a field on which forage has been sown is taken, and within it three separate enclosures or "feed-lots" are made, as shown in the diagram. The tick-infested cattle are removed from their customary pasture, and placed in one of these enclosures for twenty days, then transferred to the next for another twenty days, when, in most cases, they will be free of ticks, and can be turned into the forage field. If, however, ticks are still present, the cattle are placed in the third enclosure for fifteen days more, before being passed into the forage field.

All ticks which were on the animals when placed in the feed-lots will, by this time, have dropped off, and the feed-lots are at once ploughed, their edges sprayed with Beaumont oil or other tick-destroying agent, and the soil cultivated. The cattle are kept on the forage till some five months after they were drawn from the pasture, by which time the latter has lost its ticks by starvation, and the cattle may then be returned to it. It is essential that the feed-lots be enclosed by a fence, board-tight along the ground, to keep the ticks out of the forage field,

and it is recommended that a furrow be thrown up on both sides of the fence for the same purpose. The feed-lots should be situated at the boundary of the field, so that the cattle may pass from one to the other over the adjoining tick-free ground.

The Pasture Rotation Method.—The infected pasture is divided into two parts by a double line of fencing 10 ft. apart. All tick-infested animals are excluded from the first half of the pasture, from 1st June to 10th November, thereby rendering it tick-free. The tick-infested cattle are placed on the second half, where they are kept from 1st June to 10th September. They are then partly cleaned of ticks by putting them in a cultivated field, cleared of its crop, for twenty days. The partly cleaned cattle are then removed to a second cultivated field, where the remaining ticks will fall off within twenty days, but if any remain they are transferred to a third field for a like period. On 10th November the clean cattle are returned to the first half of the pasture, which by this time has become free from ticks. Here they are kept till May, by which time the ticks in the second half have perished. The final result is that both pasture and cattle are free from ticks.

A single female tick may lay as many as 5000 eggs, and her progeny may, in the course of seven months, come to number 6,750,000,000 individuals. It has been calculated that one beast may, as a result of tick infestation, lose as much as 500 lbs. of blood in a season. This is quite credible when the fact is borne in mind that a female tick, fully gorged with blood, weighs thirty times more than before it began to engorge. No less than 28 lbs. of ticks were taken from a horse which died from anæmia resulting from gross tick infestation. A beast, badly infested, weighed 730 lbs. It was freed from ticks by dipping, and two months later—its food and general treatment remaining the same as before dipping—it had gained 285 lbs. Newly hatched ticks can live as long as eight months without food, even during the colder season. In one experiment, cows badly infested with ticks produced 42½ per cent less milk than cows kept free from ticks.

Finally, the total annual loss sustained as a result of ticks in the United States is set down in the official year book as 100,000,000 dollars, or nearly £21,000,000.

DEHORNING CATTLE

"In the Argentine very large numbers of the cattle bred for slaughter are dehorned in their youth, with a view, of course, of saving injury when transporting takes place from ranch to freezer. In Australia this has not been done, consequently considerable losses have been attributed to injury by the horns of animals which are driven or transported to the freezer.

"It is well known that polled or dehorned cattle can be managed and fattened with greater facility than horned animals, and that, where a consignment consists solely of hornless cattle, the animals can be conveyed by sea or land with less danger of sustaining injury whilst in transit. The opinion of salesman and feeders of experience in the cattle trade is to the effect that steers for export, when horned, require more space in railway wagons, on board ships and in the market-place, that they receive more injury in transit, and that they are worth from 10/– to 15/– per head less than hornless cattle.

"The practice of dehorning cattle by sawing off or otherwise entirely removing the horns after they are partly or fully grown appears to inflict great pain upon the animals, and may even be the cause of death. A method of preventing the growth of the horns is by the application of caustic potash to the horn buds of young calves. If performed in the manner set out below, and with proper regard to the precautions which follow, the operation is comparatively painless, and can be done quickly and with ease :—

"Clip the hair from the top of the horn when the calf is from two to five days old. Slightly moisten the end of a stick of caustic potash with water (or moisten the top of the horn bud), and rub the tip of each horn firmly with the potash for about a quarter of a minute, or until a slight impression has been made on the centre of the horn. The horn should be

treated in this way from two to four times at intervals of five minutes.

"If during the interval of five minutes after one or more applications a little blood appears in the centre of the horn, it will then only be necessary to give another very slight rubbing with the potash.

"The following directions should be carefully observed :—

"1. The operation is best performed when the calf is under five days old, and should not be attempted after the ninth day.

"2. Caustic potash can be obtained from any chemist in the form of a white stick. When not in use, it should be kept in a stoppered glass bottle in a dry place, as it rapidly deteriorates when exposed to the air.

"3. One man should hold the calf while an assistant uses the caustic.

"4. A piece of tinfoil or brown paper should be rolled round the end of the stick of caustic potash which is held by the fingers, so as not to injure the hand of the operator.

"5. The stick should not be moistened too much, or the caustic may spread to the skin around the horn and destroy the flesh. For the same reason the calf should be kept from getting wet for some days after the operation.

"6. Care should be taken to rub on the centre of the horn, and not round the side of it." (Weddel & Co., Ltd., to The Transvaal Landowners' Association.)

LIVE AND DRESSED WEIGHTS

THE *National Provisioner*, in an interesting article, says :—

" The census of the United States has provided average live and dressed weights of meat animals killed in the wholesale slaughtering and meat-packing industry, and these averages, of course, are derived from an immense number of animals. Information is provided for 1899, 1904, and 1909.

" The average live weight of beeves, not including calves, was 1069 lbs. in 1899, 1047 lbs. in 1904, and 1019 lbs. in 1909. This declining average may be due to the tendency to slaughter steers at younger ages in recent years than formerly.

" The dressed weight of beeves also declined, the average being 583 lbs. for 1899, 569 lbs. for 1904, and 543 lbs. for 1909.

" With diminishing live weight the percentage represented by the dressed weight has declined, the percentage for 1899 was 54·5, for 1904 it was 54·3, and for 1909 it was 53·3 per cent.

" On the other hand, the live and dressed weights of calves have increased. For the three years in order the average live weight was 141, 167, and 168 lbs., and the average dressed weight was 90, 103, and 105 lbs. But the dressed weight as a percentage of live weight has declined since 1899. The ratios for the three years are 63·8, 61·7, and 62·5 per cent respectively.

" Sheep and lambs are combined in the census statement, and their average live weight for the three years was 84, 86, and 81 lbs., while their average dressed weight was 43, 43, and 41 lbs., constituting a fraction of live weight represented by 51·2, 50, and 50·6 per cent respectively.

" In the export frozen and chilled beef trade of Argentina the average weights of two forequarters and two hindquarters are regarded as making the dressed weight of a beef animal. Since these are mostly well-grown steers, the averages are high compared with the average dressed weight of all cattle slaugh-

tered in the wholesale slaughtering industry. The Argentine export dressed weights of beef animals increased from 689 lbs. in 1906 to 767 lbs. in 1913.

"A slaughter record in Queensland (Australia) provides average dressed weights of beef animals from 1903 to 1912 which ranged from 577 to 662 lbs. Since 1904 the averages have, on the whole, declined.

"The record for Uruguay presents a quite uniform series of average dressed weights of beef cattle from 1905 to 1910; they ranged from 558 lbs. to 580 lbs.

"The dressed weight of export sheep and lambs in Argentina is considerably above the average in wholesale slaughtering-houses in the United States. The Argentine average ranged from 53 to 65 lbs. from 1906 to 1913. The cold storage mutton and lamb for supplying the Buenos Aires city market had a dressed weight that ranged from 37 to 45 lbs. from 1906 to 1912."

VENISON

THERE seems no reason why much wider use should not be made of venison. It is an old trade, and before the war the United States was a very large customer of Great Britain in this respect. The Americans themselves have evidently been looking round in other directions for a kindred supply, and a State authority predicts that the day will soon come when reindeer meat will be as common as beef or mutton in the American markets, as the result of an investigation into conditions in Alaska. The meat will come from Alaska. It will form the basis of a large packing industry, and will be shipped in cold storage steamers and trains to every town in the United States. There were in 1916 75,000 to 100,000 reindeer in that territory. They are being handled under Government regulations, and are doubling in number every two or three years. At the present rate of increase there should be 1,000,000 in 1925. By 1931 the number should have increased to more than 3,000,000, and five years later it might be almost 13,000,000. That will be only seventeen years from now, and after that the increase should be such that reindeer meat will probably be as cheap as any other in the American markets.

A STATISTICAL STUDY OF BODY WEIGHTS, GAINS AND MEASUREMENTS OF STEERS DURING THE FATTENING PERIOD

(In *The United States Journal of Agricultural Research*, 1917.)

DURING the winter months of 1914–1915, 1915–1916, and 1916–1917, a series of body measurements of steers were made at the Pennsylvania Experiment Station, at the beginning and close of feeding experiments, for three consecutive years, with the purpose of determining the average body measurements of two-year-old steers at the beginning and close of the fattening period and the relationship of other definite body measurements to each other, and to note those measurements that could be used in selection as a means of reducing the experimental error in feeding experiments and a study of variation in the measurements themselves. Another object was to find out the correlation of gains to initial body measurements and to changes in body dimensions.

All measurements taken on a total of 216 animals divided into seven lots each year are indicated in Table I. These steers were relatively uniform as feeders, varying in market grades from " fair " to " choice," the majority being " good " feeders ; 92 were Hereford grades, 84 Shorthorn grades, 18 Aberdeen Angus grades, 7 Shorthorn × Hereford crosses, 3 Shorthorn × Aberdeen-Angus crosses, and 3 Hereford × Aberdeen-Angus crosses. In no case did a steer fail to show some infusion of improved beef blood. The average initial weight of the 216 steers was 900 pounds, with 700 and 1300 pounds as extremes. The steers were as uniform in quality, weight, and condition as would ordinarily be obtained for feeding purposes. Each year 60 steers were divided into five lots of 12 each, selected with as much care for uniformity of weight, breeding, condition, and quality as possible. The feeding of these various

lots was done with rations affording very nearly the same opportunity for gains in live weight and condition of flesh for marketing.

Table I includes all records for the three years, while the correlation tables include the data during the first two years. All body measurements except circumferences were made with the steel caliper; all circumferences were measured with a steel tape graduated in inches. The probability of error in measurements is a factor not considered, thus necessitating a large number of measurements to reduce the probable error.

TABLE I.—*Average initial and final measurements of two-year-old steers fattened for market during a 140-day feeding period.*

Measurement	Initial measurement.		Final measurement.		Difference in measurements	Percentage increase
	Number of steers	Average	Number of steers	Average		
		Pounds		*Pounds*	*Pounds*	
Weight	216	900.112	216	1.188.398	288 286	32.02
		Inches		*Inches*	*Inches*	
Width of head	214	8.832	216	9.112	0.280	3.16
Length of head	214	19.411	216	19.892	0.481	2.48
Length of neck	103	19.163	72	20.990	1.827	9.53
Width of shoulders	214	16.412	215	18.459	2.047	12.42
Width of front flank	214	16.378	216	18.358	1,980	12.08
Width of paunch	214	23.612	216	26.101	2.489	10.54
Width of rear flank	154	19.527	216	22.744	3.217	16.42
Width of loin	209	13.984	216	15.958	1.974	14.11
Width of hips	202	17.662	216	19.254	1.592	9.01
Width of thurls (Hip joint)	209	17.204	215	18.533	1.329	7.72
Buttock to hip	214	18.366	216	19.622	1.256	6.83
Depth of chest	154	26.730	215	27.789	1.059	3.96
Shoulder point to ground	214	33.033	216	34.311	1.278	3.86
Chest to ground	214	22.876	216	24.013	0.237	1.03
Hind flank to ground	214	29.128	216	30.202	1.074	3.68
Hock to ground	142	20.795	204	20.914	0.119	0.57
Withers to ground	214	49.224	216	53.870	4.646	9.43
Hips to ground	202	50.855	214	52.411	1.556	3.05
Shoulder to buttock	214	53.763	216	57.988	4.225	1.85
Circumference of chest	214	73.014	216	77.694	4.680	6.40
Circumference of paunch	214	80.256	216	88.301	8.045	10.02
Circumference of hind flank	214	71.364	216	78.685	7.321	10.25
Circumference of muzzle	141	17.198	143	17.930	0.832	4.83

These 216 steers gained at the rate of 2·058 pounds daily for 140 days.

The following average initial measurements show a marked similarity: The length of head, length of neck, and width of rear flank, which vary from 19·163 to 19·527 inches; the width of shoulder and front flank differ by only 0·034 inch; the hips and thurls (hip joint) in width are 17·682 inches and 17·204 inches, respectively; and circumference of the body in the region of the chest and hind flank are 73·014 and 71·364 inches respectively. The height at the withers of a "feeder" steer is 1·631 less than the height at the hips. The length of body from shoulder point to buttock is only 2·908 inches greater than the greatest height at the hips.

The average measurements at the conclusion of the fattening period show similarity as follows: The length of head, width of hips, and distance of buttock from hips varying within 0·638 inch of each other; the width of shoulder, front flank, and thurls are almost identical; and the circumference of the chest and hind flank are more alike than their initial measurements.

The height has increased more at the withers than at the hips; thus a two-year-old steer changes his greatest height from the hips to the withers while receiving market conditions. In circumference the increase was greater for the hind flank than for the chest; thus the greater circumference of the chest at the initial measurement becomes less than the circumference of the hind flank in the finished steer. In fattening, the greatest width at paunch and the greatest depth of body at the chest become more nearly alike, as shown by a difference of 3·118 inches at the initial measurement and 1·688 at the concluding measurement.

In all cases the difference between the initial measurement and the final measurement shows an increase in dimensions due to the depositions of fat, muscular development, and growth. The regions of the body covered by the greatest amount of muscular development show greater increased dimensions than those having less muscular covering.

In the regions where the growth would show the greater relative influence the least changes take place, as shown in the

width of head, length of head, distance from chest to ground and hock to ground. The greatest increase in width took place in the hind flank rather than in the paunch, where it would seem natural to have the greatest increase because of feed capacity and condition. The thick layer of flesh and fat deposits in the region of the hind flank, together with the distension of this region of the body in a fattened steer, are responsible for the greater width in this part of the body. The width of loin, hips, thurls, shoulders, and front flank shows changes in dimensions caused mainly by increased condition of flesh.

The increase in height at the withers of 4·646 inches is not all due to growth alone, a larger portion of this increase being caused by the flesh covering over the withers and the deposition of fat in the muscular tissues of the shoulder region. The fat deposits and muscular development cause the shoulder-blade to be held more rigidly; thus the body in the chest region rises between the shoulder-blades, as indicated by the greater distance between the withers and the upper border of the shoulder-blade. The greatest change in the body measurements was the circumference of the paunch. This, however, was proportionately less than the increase of 7·321 inches in circumference of the hind flank. The fact that the distance of chest to ground and hind flank to ground did not show greater difference was due to lowering of the flank by deposition of fat in that region and the fat covering over the region of the chest. The region of the body possessing the most valuable eatable parts on the whole are affected most in the fattening process.

Correlation Tables.—The following table (p. 322) is here presented as illustration of the methods used in obtaining the facts presented in Tables III and IV :—

TABLE II.—*Correlation of average daily gain of steers during a feeding period of 120 to 140 days, and the weight at the beginning of a feeding period.*

Correlating	Correlation coefficient	Correlating	Correlation coefficient
Gain whith initial live weight	0.036 ± 0.036	Gainwith initial length of head	0.182 ± 0.037
Gain with increase in circumference of chest	.460 ± .044	Gain with initial length from point of shoulder to buttock	.020 ± .056
Gain with initial width of rear flank	.079 ± .083	Gain with increase in circumference of paunch	.306 ± .036
Gain with initial circumference of rear flank	.221 ± .053	Gain with initial heigth of withers	.163 ± .054
Gain with initial height of point of shoulder	.061 ∓ .056	Gain with initial width of shoulders	.144 ± .055
Gain with initial height of rear flank	.053 ± .055	Gain with initial circumference of paunch	.124 ± .055
Gain with initial length of hip to buttock	.271 ± .053	Gain with increase in circumference of rear flank	.203 ± .055
Gain with initial width of loin	.108 ± .085	Width of thurls with height of rear flank	.380 ± .049
Gain with initial circumference of chest	.238 ± .053	Circumference of chest with height of withers	.621 ± .034
Gain with initial depth of chest	.130 ± .046	Width of loin with height of chest from ground	.179 ± .057
Gain with initial width of fore flank	.164 ± .054	Width of chest with depth of chest	.365 ± .072
Gain with initial distance of chest to ground	.077 ± .056		
Gain with initial width of thurls	.224 ± .054		

The results shown in Table III are based on data collected on steers during the two winter periods of 1914–15 and 1915–16. All measurements considered in this table are initial measurements except those that show increases of dimensions at the close of the fattening period as compared with the initial measurements. The coefficient of variation is shown to be greatest on increases in circumference of hind flank, paunch, and chest, and the increase in gains in live weight.

These measurements all relate to increased dimensions and occur in those parts of the body that show relatively high percentage increase over initial body measurements (Table I).

Of the initial measurements the greatest coefficient of variation is 11·9 ± 0·04 per cent for initial live weight. In all the chest measurements the coefficients of variation are relatively high: Width at point of shoulder 9·3 ± 0·52, width of fore flank 10·4 ± 0·6, depth of chest 6·1 ± 0·34, and circumference of chest 6·9 ± 0·39. Likewise the mid and posterior regions of the body show variations, the rear flank with a coefficient of variation of 8·7 ± 0·48, circumference of rear flank 6 ± 0·34, width of loin 7·5 ± 0·43, width of thurls 5·9 ± 0·34, circumference of paunch 11 ± 0·62, and distance of hips to buttock 5·2 ± 0·29.

TABLE III.—*Means, standard deviations, and coefficients of variation presented in correlation tables.*

Number of steers	Measurements	Mean	Standard deviations	Coefficient of variation
		pounds	pounds	Per cent
388	Average daily gain . . .	1.93 ± 0.016	0.446 ± 0.011	23.1 ± 0.84
388	Initial live weight . . .	893.93 ± 3.94	106.88 ± 2.77	11.9 ± .04
142	Total gain in live weight	288.55 ± 3.10	54.77 ± 2.19	19.1 ± 1.08
		Inches	Inches	
142	Increase in circumference of chest	8.13 ± .10	1.87 ± .074	23.0 ± 1.30
142	Width of rear flank . . .	19.25 ± .09	1.69 ± .06	8.7 ± .48
142	Circumference of rear flank	72.76 ± .25	4.40 ± .17	6.0 ± .34
142	Height of shoulder point	34.10 ± .08	1.57 ± .06	4.5 ± .25
142	Height of rear flank . .	30.23 ± .09	1.67 ± .06	5.5 ± .31
142	Distance, hip to buttock	18.69 ± .05	.99 ± .03	5.2 ± .29
137	Width of loin	13.96 ± .06	1.05 ± .22	7.5 ± .43
142	Circumference of chest .	69.82 ± .22	3.91 ± .01	6.9 ± .39
142	Depth of chest	25.77 ± .08	1.59 ± .063	6.1 ± .34
142	Width of fore flank . . .	15.02 ± .08	1.57 ± .06	10.4 ± .60
142	Distance, chest to ground	22.89 ± .06	1.18 ± .04	5.1 ∓ .28
136	Width of thurl	17.36 ± .05	1.03 ± .04	5.9 ± .34
142	Length of head	19.53 ± .04	.81 ± .03	4.1 ∓ .23
142	Length of shoulder to buttock	55.66 ± .17	3.02 ± 2.84	5.4 ± .30
142	Increase in circumference of paunch	8.26 ± .16	2.96 ± .11	35.8 ± 2.02
142	Height of withers	49.50 ± 1.07	1.95 ∓ .07	4.9 ± .27
142	Width at point of shoulder	16.42 ± .08	1.54 ± .06	9.3 ± .52
142	Circumference of paunch.	81.60 ± .56	10.04 ± 4.02	10.0 ± .62
138	Increase in circumference of rear flank	17.52 ± .20	3.51 ± .14	46.6 ± 2.67

The measurements affected most by growth show the least variations and include the distance of shoulder point, rear flank, and withers from the ground, length of head, and distance of shoulder point to buttock.

In general, Table III shows the greatest variation in those regions of the body which change most in a fattening steer and those regions affected most by deposition of fat and development of muscular tissue.

Table IV, a summary of the coefficients of correlation, shows that increases in body measurements have a closer relationship with gains in live weight than the initial measurements. With the exception of initial weight these measurements, as shown in Table II, also had high coefficients of variation.

TABLE IV.—*Summary of correlations*

Daily gain (pounds)	Initial weight per steer (pounds)													Total
	1 300	1 250	1 200	1 150	1 100	1 050	1 000	950	900	850	800	750	700	
3.2	—	—	—	—	—	—	—	1	—	—	—	—	—	1
3.0	—	—	—	—	—	—	—	—	—	—	—	—	—	0
2.8	—	—	—	—	1	1	3	1	1	2	1	1	—	11
2.6	—	—	—	—	—	4	2	2	4	1	3	3	1	20
2.4	—	1	—	1	2	1	5	8	11	7	6	3	2	47
2.2	—	1	—	2	2	—	4	7	4	7	4	5	—	36
2.0	1	1	—	3	—	1	4	7	9	16	9	12	2	65
1.8	—	1	—	3	2	2	5	7	11	10	9	7	6	63
1.6	—	—	1	—	—	1	5	3	5	4	4	5	4	32
1.4	—	—	—	1	2	—	4	4	10	3	7	1	1	33
1.2	—	—	2	—	—	2	2	4	2	6	2	1	1	22
1.0	—	—	—	—	—	—	—	1	2	—	1	1	—	5
0.8	—	—	—	—	—	1	—	—	2	—	—	—	—	3
Total	1	4	3	10	9	13	34	45	61	56	46	39	17	338

Mean live weight	pounds	893.93	± 3.94
Mean daily gain	do.	1.95	∓ .016
Standard deviation of live weight	do.	106.88	± 2.777
Standard deviation of daily gain	do.	0.446	± .011
Correlation	do.	0.0364	± .036

The correlation coefficients for the two body circumferences of chest and rear flank, the width of thurls (hip joint), and the distance of hip to buttock show the closest relationship of all

the initial measurements with gains in live weight. This suggests the possibilities of using these measurements in the selection of feeding steers, at least for experimental purposes, as a means of reducing the experimental error caused by individuality of animals.

The measurement of initial weight shows no relationship with gains, although this is usually considered one of the most important factors in selection of steers for experimental purposes.

Measurements that show intermediate relationship as indicated by coefficients of correlation are width of loin, depth of chest, width of fore flank, length of head, height of withers, circumference of paunch, and width of shoulders.

Measurements in which slight or no relationship exist as shown by correlation coefficients are initial live weight, width of rear flank, height at shoulder point, and the distance of rear flank and chest from the ground.

A close relationship of circumference of chest with height of withers is indicated by $r \pm 0{\cdot}621 \pm 0{\cdot}034$. Likewise, the width of chest and depth of chest by $r = 0{\cdot}365 \pm 0{\cdot}072$ show a definite relationship.

The hind quarters of a steer are more important than the fore quarters in determining the gaining capacity of a steer, with the exception of the circumference of chest as shown by a correlation coefficient of $0{\cdot}224 \pm 0{\cdot}054$ for width of thurls, $0{\cdot}271 \pm 0{\cdot}053$ for distance of hip to buttock, and $0{\cdot}221 \pm 0{\cdot}053$ for circumference of rear flank.

The circumference of chest and rear flank are more important in ascertaining gains than feed capacity as indicated by the circumference of paunch.

LIST OF MEAT CANNING AND PRESERVING WORKS IN AUSTRALASIA

NEW SOUTH WALES

Alexandria Meat Preserving Works, Alexandria.—Capacity, 80,000 12-oz. tins per week.

Angliss and Co. (N.S.W.) Prop. Ltd., Wm., Daroobalgie Freezing Works, Forbes.—Capacity, 6000 2-lb. tins preserved meat per day.

Barnes Ltd., James, Alexandria.—Capacity, 24,000 12-oz. tins preserved meat per day.

Byron Bay Packing and Chilling Company Ltd., Byron Bay.—Capacity, 11,000 24-oz. tins preserved meat per day.

Cooke and Co. Prop. Ltd., John, Sandown Freezing Works, Parramatta.—Capacity, 10,000 12-oz. tins preserved meat per day.

Glen Packing Company, Camperdown.—Capacity, 33,000 24-oz. tins preserved meat per day.

Hunter River Meat Preserving Company Ltd., Leichhardt.—Capacity, 20,000 24-oz. tins preserved meat daily.

Kensington Meat Preserving Company, Ramornie.

Lilyfield Packing Company Ltd., Leichhardt.—Capacity, 15,000 24-oz. tins preserved meat per day.

Little and Co., Robert, Merriwa.—Rabbit canning works.

National Meat Preserving Company Ltd., Balmain.—Capacity, 33,000 24-oz. tins preserved meat per day.

North Coast Co-operative Company Limited, Byron Bay.—Capacity, approximately 15,000 1-lb. tins preserved meat per month.

O.K. Meat Company, South Grafton.

Sydney Meat Preserving Company Ltd., Auburn.—Capacity, 3500 6-lb. tins preserved meat per day.

Union Meat Company Limited, Tibbereena.—Capacity, 6000 2-lb. tins preserved rabbits daily.

Also rabbit canning works at Coonamble, with capacity of 3000 2-lb. tins daily.

VICTORIA

Angliss and Co. Prop. Ltd., Wm., Imperial Freezing Works, Footscray.—Capacity, 100 cattle and 1000 sheep per day.

Borthwick and Sons (Australasia) Ltd., Thos., Portland Freezing Works, Portland.—Capacity, 20 cattle per day.

Clark and Son Prop. Ltd., E. A., Victorian Export Canning Works.—Capacity, 2000 to 3000 lbs. meat per day.

Flemington Meat Preserving Company Prop. Ltd., Lang's Road, Ascot Vale.—Capacity, 25,000 24-oz. tins preserved meat per day. Accommodation provided for slaughtering 2500 sheep per day.

Geelong Harbour Trust, Corio Freezing Works, Geelong.

QUEENSLAND

Australian Meat Export Company Ltd., Alligator Creek Freezing Works Townsville.—Capacity, 150 cattle per day.
Brisbane River Freezing Works, Brisbane.—Capacity, 150 cattle per day.

Baynes Bros., Queensport, Brisbane.—Capacity, 80 cattle per day.

Bergl Australia Ltd., Bowen Meat Freezing Works, Bowen.—Capacity, 50 cattle per day.

Birt and Co. Ltd., Biboohra, Cairns.—Capacity, 150 cattle per day.

Borthwick and Sons (Australasia) Ltd., Thomas, Moreton Freezing Works, Brisbane.—Capacity not specified.

Central Queensland Meat Export Company Ltd., Lakes Creek Freezing Works, Rockhampton.—Capacity, 40,000 lbs. meat per day.

Cooke and Co. Prop. Ltd., John, Redbank Freezing Works, via Brisbane.—Capacity, 50 cattle per day.

Queensland Meat Export Company Ltd., Eagle Farm Freezing Works, Brisbane.—Capacity, 70 cattle per day.
Ross River Freezing Works, Townsville.—Capacity, 36,000 lbs meat per day.

Rosewarne (Queensland) Ltd., Brisbane.—Capacity, 1000 cattle per week.

SOUTH AUSTRALIA

South Australian Government.—Ocean Steamers' Wharf, Port Adelaide.—Capacity, 1000 6-lb. or 3000 2-lb. tins of meat per day.

Wilcox, Mofflin Ltd., Compton, Mt. Gambier.—Used for canning rabbits only.

WESTERN AUSTRALIA

Proposed.

Nor.-West Meat Works Ltd., Carnarvon.—Capacity, 1500 sheep per day.

NORTHERN TERRITORY

North Australian Meat Co. Ltd., Darwin.—Capacity, not specified.

NEW ZEALAND

Borthwick and Sons (Aust.) Ltd., Thos., Waitara Freezing Works, Waitara.—Capacity, 40 head cattle per day.

Canterbury Frozen Meat and O.P. Export Co. Ltd., Belfast Freezing Works, Belfast.—Capacity, 3000 lbs. preserved meat per day.

East Coast Co-operative Freezing Co. Ltd., Whakatane Freezing Works, Whakatane.—Capacity, 50 head cattle per day.

Enterprise Meat Works, Winton.

Feilding Farmers' Freezing Co. Ltd., Feilding Freezing Works, Aorangi, Feilding.

Gear Meat Preserving and Freezing Company of N.Z. Ltd., Petone Freezing Works, Petone.—Capacity, 3,000,000 lbs. meat per season.

Gisborne Sheepfarmers' Frozen Meat Company Ltd., Kaiti Freezing Works, Gisborne.—Capacity, 5000 lbs. meat per day.

Nelson Bros. Ltd., Tomoana Freezing Works, Tomoana.—Capacity, 1000 to 1200 lbs. meat per day.

New Zealand Refrigerating Company Ltd., Imlay Freezing Works, near Wanganui.—Capacity, 6000 lbs. meat per day.
Islington Freezing Works, Islington.—Capacity, 6000 lbs. meat per day.

New Zealand Farmers' Co-operative Bacon and Meat Packing Co. Ltd.—Ngahauranga Works, near Wellington.—Capacity, 90 head cattle or 30,000 lbs. meat per day.

Patea Farmers' Co-operative Freezing Co. Ltd., Patea Freezing Works, Canville.—Capacity, 16,000 lbs. meat per day.

Poverty Bay Farmers' Meat Co. Ltd., Waipaoa Freezing Works, Gisborne.—Capacity, 18,000 lbs. meat per day.

Taranaki Farmers' Meat Co. Ltd., New Plymouth Freezing Works, New Plymouth.—Capacity, 9000 lbs. meat per day.

Tait, W. E., Woodlands Meat Preserving Works, Invercargill.—Capacity, 11,000 lbs. preserved meat per day.

Wanganui Meat Freezing Company Ltd., Castlecliff Freezing Works, Castlecliff.—Capacity, 6500 lbs. preserved meat per day.

Wellington Farmers' Meat Company Ltd. (1), Waingawa Freezing Works, near Masterton.—Capacity, 20,000 lbs. meat daily.

Wellington Meat Export Company Ltd., Ngahauranga Freezing Works, near Wellington.—Capacity, 1500 carcases mutton per day.

Westfield Freezing Co. Ltd., Westfield Freezing Works, near Auckland.—Sixty bodies beef per day.

Whangarei Freezing Co. Ltd., Whangarei Freezing Works, Reatahi, Whangarei Heads.—Twenty bodies beef per day.

(1) Capacity being increased to 50,000 lbs. of meat per day.

LIST OF REFRIGERATING WORKS EMPLOYED IN THE MEAT EXPORT TRADE IN AUSTRALIA AND NEW ZEALAND

GIVING APPROXIMATE DAILY RECEIVING AND STORAGE CAPACITY

QUEENSLAND

Australian Meat Export Company Ltd., Brisbane River Works, Brisbane.—750 cattle and 3000 sheep per day, storage capacity, 40,000 quarters beef and 135,000 carcases mutton ; total, 4000 tons.

Alligator Creek Works, Townsville.—750 cattle and 2000 sheep per day ; storage capacity, 40,000 quarters beef and 135,000 carcases mutton ; total, 4000 tons.

Bergl Australia Ltd., Bowen Meat Freezing Works, Bowen.—150 cattle per day ; storage capacity, 1500 tons.

Birt and Co. Ltd., Musgrave Wharf Cold Stores, South Brisbane.—100 cattle or 1100 sheep per day ; storage capacity, 750 tons.

Murarrie Works, near Brisbane.—150 cattle or 1500 sheep per day ; storage capacity, 700 tons.

Borthwick and Sons (Australasia) Ltd., Thos., Moreton Freezing Works, Brisbane.—250 cattle or 4000 sheep per day ; storage capacity, 1000 tons.

Burdekin River Meat Preserving Company Ltd., Burdekin Works, Sellheim.—260 cattle or 2000 sheep per day ; storage capacity, 1200 tons.

Central Queensland Meat Export Company Ltd., Lakes Creek Works, Rockhampton.—500 cattle or 3000 sheep per day ; storage capacity, 3000 tons.

Cooke and Co. Prop. Ltd., John, Redbank Works, via Brisbane.—400 cattle, or 280 cattle and 1600 sheep per day ; storage capacity, 2800 tons.

Gladstone Meat Works of Queensland Ltd., Gladstone Works, Gladstone.—400 cattle or 3500 sheep per day, or 200 cattle and 2000 sheep per day ; storage capacity, 2500 tons.

Queensland Government, Charleville Works, Charleville.—Storage capacity, 160 quarters beef, 600 to 800 carcases of mutton.

Queensland Meat Export Company Ltd., Eagle Farm Works, Brisbane.—330 cattle and 300 sheep, or 150 cattle and 2000 sheep per day ; storage capacity, 32,000 quarters beef, or 105,000 carcases mutton ; total, 2000 tons.

Ross River Works, Townsville.—750 cattle, or 700 cattle and 1000 sheep, or 600 cattle and 2000 sheep, or 550 cattle and 2500 sheep per day ; storage capacity, 88,000 quarters beef, or 290,000 carcases mutton ; total, 5500 tons.

NEW SOUTH WALES

Angliss and Co. (N.S.W.) Prop. Ltd., W., Daroobalgie Works, near Forbes.—4000 sheep and 250 cattle per day, and 4000 crates rabbits weekly ; storage capacity, 100,000 carcases lamb.

Australian Chilling and Freezing Company Ltd., Aberdeen Works, near Newcastle.—100 cattle and 3000 sheep per day ; storage capacity, 60,000 carcases mutton,

Cooke and Co. Prop. Ltd., John, Sandown Works, near Parramatta.—7000 sheep, or 400 cattle and 3000 sheep per day ; storage capacity, 255,000 carcases mutton.

Crystal Ice and Cold Storage Company Ltd., works, Balmain, Sydney.—1500 sheep per day ; storage capacity, 40,000 carcases mutton.

Metropolitan Ice and Cold Storage Company Ltd., works, Harris Street, Sydney. —1200 sheep per day ; storage capacity, 40,000 carcases mutton.

Metropolitan Meat Industry Board, temporary meat distributing depot, Pyrmont, Sydney.—Storage capacity, 1000 carcases mutton.

Municipal Cold Storage Works, Sydney.—Storage capacity, 100,000 carcases mutton.

New South Wales Fresh Food and Ice Company Ltd., Darling Harbour Works, Sydney.—6000 sheep per day ; storage capacity, 170,000 carcases mutton.

Pastoral Finance Association Ltd., Kirribilli Point Works, Sydney.—2500 sheep per day ; storage capacity, 75,000 carcases mutton.

Riverina Frozen Meat Company Prop. Ltd., Deniliquin Works, Deniliquin (shipping, via Melbourne).—1500 sheep per day ; storage capacity, 40,000 carcases mutton.

Sydney Ice Skating Rink and Cold Storage Company Ltd., cold stores, Harris Street, Ultimo, Sydney.—2500 sheep per day ; storage capacity, 60,000 carcases mutton.

IN COURSE OF ERECTION

Walker and Co., F. J., Tibbereena Meat Works.—Estimated killing capacity, 1000 sheep and 80 head cattle per day.

Waterside Cold Stores Ltd., Jones Bay, Sydney.—Estimated storage capacity, 100,000 carcases mutton.

VICTORIA

Angliss and Co. Pty. Ltd., Wm.,* works, Bourke Street, Melbourne.—2000 lambs per day ; storage capacity, 25,000 carcases lamb.

City Market Cool Stores and Ice Works,* King Street, Melbourne.—2000 carcases lamb per day ; storage capacity, 120,000 carcases lamb.

Imperial Freezing Works, Footscray, near Melbourne.—11,000 sheep or lambs and 250 cattle per day ; storage capacity, 250,000 carcases lamb or equivalent in beef.

Borthwick and Sons (Australasia) Ltd., Thomas, Portland Freezing Works, Portland.—40 cattle and 1100 lambs per day ; storage capacity, 20,000 carcases lamb.

Brooklyn Freezing Works, Footscray.—5000 lambs and 50 cattle per day ; storage capacity, 76,800 carcases lamb.

Cooke and Co. Prop. Ltd., John, Newport Freezing Works, near Melbourne. —Kill 6000 and freeze 4000 lambs per day ; storage capacity, 120,000 carcases lamb.

Fletcher Ltd., W. and R., North Shore Freezing Works, Geelong.—1600 lambs per day ; storage capacity, 28,000 carcases lamb.

Geelong Harbour Trust, Geelong.—200 cattle and 9000 sheep or lambs per day ; storage capacity, 150,000 carcases mutton.

Goulburn Valley Industries Company Ltd., Shepparton.—1600 sheep or lambs per day ; storage capacity, 50,000 carcases lamb.

Melbourne Cool Stores and Ice Works (W. Dunkerley, propr.), Flinders Lane, Melbourne.—Storage only ; capacity, 60,000 carcases lamb.

Melbourne Ice Skating and Refrigerating Company, The Glaciarium, Melbourne.—2500 carcases lamb per day ; storage capacity, 45,000 carcases lamb.

Metropolitan Ice and Cold Store Works (W. Dunkerley, Propr.), Blackwood Street, North Melbourne.—Storage only ; capacity, 50,000 carcases lamb.

Sennitt and Son Prop. Ltd.,* works, Miller Street, Melbourne.—1000 carcases lamb per day ; storage capacity, 30,000 carcases lamb.

Victorian Butter Factories Co-operative Co.,* works, Flinders Street Extension, Melbourne.—2000 carcases lamb per day ; storage capacity, 50,000 carcases lamb.

Victorian Government,* Victoria Docks Stores, Melbourne.—3500 carcases mutton or lamb per day ; storage capacity, 150,000 carcases lamb. (Total refrigerated space, 750,000 cubic feet.)

Wimmera Inland Freezing Company Ltd., Murtoa Works, Murtoa.—2600 sheep or lambs per day ; storage capacity, 60,000 carcases lamb.

SOUTH AUSTRALIA

South Australian Government, State Refrigerating Works, Port Adelaide.—120 cattle and 8000 sheep or lambs per day ; storage capacity, 300,000 carcases mutton (600,000 cubic feet).

Light Square Works, Adelaide.—3000 carcases mutton per day ; storage capacity, 65,000 carcases mutton (150,000 cubic feet).

NORTHERN TERRITORY

Vestey Bros., Darwin, Northern Territory, 500 cattle per day ; capacity, 6000 tons beef, equivalent to about 200,000 carcases mutton.

WESTERN AUSTRALIA

Baker Bros., Works, Fremantle.—100–150 cattle per week ; storage capacity, 26,139 cubic feet.

Western Fresh Food and Ice Company, Works, Fremantle.—1000 carcases lamb per day ; storage capacity, 3500 cubic feet.

Western Australian Government, Wyndham Works, Wyndham.—Approximately 300 to 400 cattle per day ; storage capacity, 16,400 qrs. beef —1264 tons.

NEW ZEALAND

Auckland Farmers' Freezing Company Ltd., Horatiu Works, Horatiu, Waikato.—3000 sheep or 220 cattle per day ; storage capacity, 180,000 carcases mutton.

Southdown Works, Penrose, Auckland.—3000 sheep or 220 cattle per day ; storage capacity, 172,000 carcases mutton.

Auckland Works, Auckland.—Storage only, 130,600 carcases mutton.

Borthwick and Sons (Australasia) Ltd., Thos., Paki Paki Works, Hastings, Hawkes Bay.—2000 sheep and 30 cattle per day ; storage capacity, 60,000 carcases mutton.

Canterbury Works, Belfast, near Christchurch.—4000 sheep per day ; storage capacity, 80,000 carcases mutton.

Waitara Works, Waitara, Taranaki.—2000 sheep and 200 cattle per day ; storage capacity, 80,000 carcases mutton.

* The figures given here denote only such space as is set apart for the frozen meat trade. The total capacity of the works is in most cases considerably larger. The stores are also used for freezing and storing butter, rabbits and other perishable produce.

Canterbury Frozen Meat and D.P. Export Company Ltd., Belfast Works, Belfast, Canterbury.—6000 sheep and 100 cattle per day; storage capacity, 190,000 carcases mutton.

Fairfield Works, Ashburton.—4000 sheep and 25 cattle per day; storage capacity, 80,000 carcases mutton.

Pareora Works, Pareora, near Timaru.—4500 sheep and 35 cattle per day; storage capacity, 178,000 carcases mutton.

East Coast Co-operative Freezing Co. Ltd., (1) Whakatane Works, Whakatane, Bay of Plenty.—1000 sheep and 200 cattle per day; storage capacity, 100,000 carcases mutton.

Feilding Farmers' Freezing Company Ltd., Feilding Works, Aorangi, Feilding.—1400 sheep per day; storage capacity, 130,000 carcases mutton.

Gear Meat Preserving and Freezing Company Ltd. Petone Works, Petone, near Wellington.—10,000 sheep and 100 cattle per day; storage capacity, 400,000 carcases mutton.

Gisborne Sheepfarmers' Frozen Meat Company Ltd., Kaiti Works, Kaiti, Gisborne.—4500 sheep and 120 cattle per day; storage capacity, 234,000 carcases mutton.

Hawkes Bay Farmers' Meat Company Ltd., Whakatu Works, Whakatu, near Hastings.—2000 sheep and 80 cattle per day; storage capacity, 130,000 carcases mutton.

National Mortgage and Agency Company Ltd., Longburn Works, Longburn, near Palmerston North.—1500 sheep and 70 cattle per day; storage capacity, 120,000 carcases mutton.

Nelson Bros. Ltd.—Tomoana Works, Tomoana, Hawkes Bay.—3000 sheep and 80 cattle per day; storage capacity, 155,500 carcases mutton.

Taruheru Works, Taruheru, near Gisborne.—3000 sheep and 85 cattle per day; storage capacity, 95,000 carcases mutton.

Hornby Works, Hornby, near Christchurch.—1500 sheep per day; storage capacity, 64,000 carcases mutton.

Nelson Freezing Company Ltd., Stoke Works, Stoke, near Nelson.—350 sheep and 20 cattle per day; storage capacity, 30,000 carcases mutton.

New Zealand Refrigerating Co. Ltd., Islington Works, Islington, near Christchurch.—7000 sheep and 50 cattle per day; storage capacity, 291,000 carcases mutton.

Smithfield Works, Smithfield, near Timaru.—6000 sheep and 50 cattle per day; storage capacity, 186,000 carcases mutton.

Pukeuri Works, Pukeuri, near Oamaru.—3000 sheep per day; storage capacity, 200,000 carcases mutton.

Burnside Works, Burnside, near Dunedin.—3500 sheep and 50 cattle per day; storage capacity, 216,000 carcases mutton.

Picton Works, Marlborough.—1000 sheep and 30 cattle per day; storage capacity, 23,000 carcases mutton.

Imlay Works, Wanganui.—6000 sheep and 200 cattle per day; storage capacity, 250,000 carcases mutton.

New Zealand Farmers' Co-operative Bacon and Meat Packing Co. Ltd., Eltham Works, Taranaki.—150 pigs and 60 cattle per day; storage capacity, 25,000 carcases mutton.

Frankton Junction Works, Waikato.—300 pigs per day; storage capacity, 25,000 carcases mutton.

Ngahauranga Works, near Wellington.—1200 pigs, 70 cattle and 600 sheep per day; storage capacity, 50,000 carcases mutton.

Te Aroha Works, Thames Valley.—150 pigs per day.

North British and Hawkes Bay Freezing Company, Spit Works, Port Ahuriri, Napier.—2500 sheep per day; storage capacity, 50,000 carcases mutton.

North Canterbury Sheep Farmers' Co-operative Freezing Co., Kaiapoi Works, near Christchurch.—2500 sheep and 25 cattle per day; storage capacity, 200,000 carcases mutton.

Otaihape Farmers' Meat and Produce Company Ltd., Winiata Works, Winiata, near Taihape.—1200 sheep and 50 cattle per day; storage capacity, 120,000 carcases mutton.

Patea Farmers' Freezing Company, Patea Works, Canville, near Patea.—1500 sheep and 150 cattle per day; storage capacity, 140,000 carcases mutton.

Poverty Bay Farmers' Meat Company, Waipaoa Works, near Gisborne, Poverty Bay.—4000 sheep and 200 cattle per day; storage capacity, 200,000 carcases mutton.

Southland Frozen Meat and Produce Export Company Ltd., Bluff Works, Bluff, Southland.—Storage only, 115,000 carcases mutton.

Mataura Works, Mataura, Southland.—2000 sheep and 100 cattle per day; storage capacity, 92,000 carcases mutton.

Wallacetown Works, Makarewa, Southland.—2000 sheep and 120 cattle per day; storage capacity, 74,000 carcases mutton.

South Otago Freezing Company Ltd., Finegand Works, Balclutha, South Otago.—2500 sheep and 40 cattle per day; storage capacity, 200,000 carcases mutton.

Taranaki Farmers' Meat Co. Ltd., New Plymouth Works, New Plymouth, Taranaki.—1500 sheep and 150 cattle per day; storage capacity, 120,000 carcases mutton.

Tokomaru Sheepfarmers' Freezing Company Ltd., Tokomaru Works, Tokomaru Bay.—3000 sheep and 50 cattle per day; storage capacity, 130,000 carcases mutton.

Wairoa Farmers' Co-operative Meat Co. Ltd., Wairoa Works, Wairoa, Hawkes Bay.—2000 sheep and 50 cattle per day; storage capacity, 125,000 carcases mutton.

Wanganui Meat Freezing Company Ltd., Castlecliff Works, Castlecliff, Wanganui River.—3000 sheep and 80 cattle per day; storage capacity, 110,000 carcases mutton.

Ward and Co. Ltd., J. G., Ocean Beach Freezing Works, Bluff.—3000 sheep and 120 cattle per day; storage capacity, 115,000 carcases mutton.

Wellington Farmers' Meat Company Ltd. (2) Waingawa Works, Waingawa, near Masterton.—7000 sheep and 250 cattle per day; storage capacity, 270,000 carcases mutton.

Kakariki Works, Kakariki, near Marton.—2000 sheep and 50 cattle per day; storage capacity, 100,000 carcases mutton.

Wellington Meat Export Company Ltd., Ngahauranga Works, Ngahauranga, near Wellington.—7000 sheep and 130 cattle per day; storage capacity, 240,000 carcases mutton.

Westfield Freezing Company Ltd. (3) Westfield Works, near Auckland.—2000 sheep and 200 cattle per day; storage capacity, 175,000 carcases mutton.

(1) Storage for an additional 40,000 carcases in course of erection.
(2) Storage for an additional 80,000 carcases in course of erection.
(3) Storage for an additional 50,000 carcases in course of erection.

Whangarei Freezing Company Ltd., Whangarei Works, Reotahi, Whangerei Heads.—1200 sheep or 150 cattle per day; storage capacity, 90,000 carcases mutton.

LIST OF FREEZING WORKS OPERATING IN SOUTH AMERICA.

ARGENTINA

Compania Sansinena de Carnes Congeladas.—Works, Bahia Blanca (Cuatreros), Buenos Aires.
Sociedad Anonima " La Blanca " Company.—Works, Buenos Aires.
Frigorifico Argentino Central.—Works, Buenos Aires.
Compania Swift de la Plata.—Works, La Plata ; also Gallegos and San Julian.
La Plata Cold Storage Company.—Works, Buenos Aires.
Frigorifico Armour de la Plata.—Works, La Plata.
British and Argentine Meat Company Ltd.—Works, Campana.
British and Argentine Meat Company Ltd. (Las Palmas Produce Co.).—Works, Las Palmas.
Anglo-South American Meat Co.—Works, Zarate.
Smithfield and Argentine Meat Co. Ltd.—Works, Zarate.
Swift and Company.—Works, Saladillo.
New Plant building.—Company's title not settled.—Santa Cruz.
Frigorifico Wilson.—Works, Buenos Aires.
Le Frigorifico Santafecino (a French-Argentine Syndicate).—Works, Venado Tuerto (Santa Fé).

CHILE AND PATAGONIA

La Compania Frigorifico Argentino de Tierra del Fuego.—Works, Rio Grand.
Frigerico Punta Arenas.—Works, Punta Arenas.
New Patagonia Meat and Cold Storage Company.—Works, Puerto Gallegos.
South American Export Syndicate Ltd.—Works, Rio Seco.
La Compania de Frigorifica, Patagonia.—Works, San Gregorio.
La Compania Frigorifica de Puerto Natales.—Works, Puerto Natales.
Cia Exploadora de Tierra del Fuego.—Works, Puerto Bories.

URUGUAY

La Frigorifica Uruguaya.—Works, Monte Video.
Frigorifico Swift de Monte Video.—Works, Monte Video.
Frigorifico Hall (Vestey Bros.).—Works, Monte Video.
Frigorifico Artigas.—Works, Monte Video.
Morris and Co.—Works, Monte Video.
Armour and Co., del Uruguay Sec. Anon.—Works, Monte Video.

PARAGUAY

Compania Paraguaya de Frigorificos de Carnes Congeladas.—(Canning only.)
Central Products Company.—Works, Asuncion ; (canning only).
Frigorifico San Salvador de Paraguay.—Works, San Salvador.

BRAZIL

Companha Armour do Brazil Sociedad Anonima Santa Anna do Livramento. Works, Rio Grande do Sul.

Companha Armour do Brazil Sociedad Anonima Frigerifico Sao Paulo (Sao Paulo).—Works, Santos.

Companha Mechanica e Importadora de Sao Paulo.—Works, Barretos, near, Sao Paulo.

Companha Frigorifico e Pastoral do Sao Paulo.—Works, Barretos.

Continental Products Co.—Works, Ozaseo Sao Paulo ; Santos.

Companha Brittannica do Carnes.—Works, Rio de Janeiro.

Empreza de Armazen Frigorificos.—Works, Rio de Janeiro.

Central Products Co.—Works, Sao Paulo.

Union Cold Storage Co.—Works, Mendes.

Companha Swift do Brazil.—Works, Rio Grand do Sul ; also at Rosario.

Port Company.—Freezing and Storage only at Rio.

Companha Docas do Santos.—Freezing and Storage only at Santos.

Brazilero Co. (Empreza Armazen Frigorificos).—Leased to British and Argentine Meat Co.—Works, Rio Grande do Sul.

Brazilian Meat Co.—Works, Mendes.

VENEZUELA

Venezuelan Meat and Products Syndicate Ltd.—Works, Puerto Cabello.

PRINTED IN GREAT BRITAIN
BY WM. BRENDON AND SON, LTD., PLYMOUTH.

UNIVERSITY OF CALIFORNIA LIBRARY
BERKELEY

Return to desk from which borrowed.
This book is DUE on the last date stamped below.

14May'49JA

ICLF (N)

5Jun'49JA

MAR 15 1967 4 M

30Aug'56CB

REC'D

REC'D LD

MAR 20'67 -9 AM

SEP 8 1956

LOAN DEPT.

26Mar'65JA

REC'D LD

MAR 12'65 -6 PM

LD 21-100m-9,'48(B399s16)476

TC 11562

LIBRARY USE
RETURN TO DESK FROM WHICH BORROWED

LOAN DEPT.

THIS BOOK IS DUE BEFORE CLOSING TIME
ON LAST DATE STAMPED BELOW

LIBRARY USE
MAY 2 '64

IGLF (N)

REC'D LD
MAY 2 '64 -1 AM

eral Library
ity of California
Berkeley